Better Crops WITH PLANT FOOD

March 1951 10 Cents

The Pocket Book of Agriculture

INTRODUCING the New

AGRICULTURAL PENTAHYDRATE BORAX

The introduction of this new product to the agricultural trade represents an achievement in product research and development designed to provide a high analysis fertilizer grade Borax at minimum cost.

CHARACTER OF PRODUCT Contains a minimum of 44% B_2O_3 or approximately 121% equivalent Borax.

ADVANTAGE More economical because the Borate which comes to you in this form is more concentrated.

PURPOSE To correct a deficiency of Boron in the soil and thus enhance the productivity of crops.

RECOMMENDED USES As an addition to mixed fertilizer, or for direct application to the soil.

FOR CORRECT APPLICATION Consult your local County Agent or State Experimental Station.

A member of the well-known "Three Elephant" Boron product family.

THREE ELEPHANT BRAND

REG. U. S. PAT. OFF.

AMERICAN POTASH & CHEMICAL CORPORATION

122 EAST 42nd STREET • • • NEW YORK 17, N. Y.

231 S. LA SALLE STREET
CHICAGO 4, ILLINOIS

214 WALTON BUILDING
ATLANTA 3, GEORGIA

3030 WEST SIXTH STREET
LOS ANGELES 54, CALIF.

"Pioneer Producers of Muriate in America"

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXV NO. 3

TABLE OF CONTENTS, MARCH 1951

Too Much Velvet? 3
Jeff Sees a Danger in It

Fertilizing the Corn Crop in Wisconsin 6
C. J. Chapman Gives His Recommendations

Increasing Cotton Fields in North Carolina 11
C. D. Welch and W. L. Nelson Tell How to Do It

Know Your Soil: Penn Silt Loam 15
No. VIII in the Series by J. B. Hester, F. A. Shelton, and R. L. Isaacs, Jr.

A Look at Alfalfa Production in the Northeast 18
J. B. Washko Reports His Observations

Clinics for Sick Soil 23
N. M. Coleman Describes Them

Meeting the Cotton Goal 25
Claude L. Welch Specifies Ways and Means

The American Potash Institute, Inc.

1155 16th Street, N. W., Washington 6, D. C.

Member Companies: American Potash & Chemical Corporation
United States Potash Company
Potash Company of America

Washington Staff

H. B. Mann, *President*
J. W. Turrentine, *President Emeritus*
J. D. Romaine, *Chief Agronomist*
R. H. Stinchfield, *Publications*
Mrs. H. N. Hudgins, *Librarian*

Branch Managers

S. D. Gray, *Washington, D. C.*
J. F. Reed, *Atlanta, Ga.*
G. N. Hoffer, *Lafayette, Ind.*
M. E. McCollam, *San Jose, Calif*
E. K. Hampson, *Hamilton, Ont.*

Getting Acquainted

Better Crops with PLANT FOOD

PUBLISHED BY THE AMERICAN POTASH INSTITUTE, INC., 1155 SIXTEENTH STREET, N.W., WASHINGTON 6, D. C., SUBSCRIPTION, $1.00 FOR 12 ISSUES; 10¢ PER COPY. COPYRIGHT, 1951, BY THE AMERICAN POTASH INSTITUTE, INC.

VOL. XXXV WASHINGTON, D. C., MARCH 1951 No. 3

Are We Giving . . .

Too Much Velvet?

Jeff McDermid

YES, sir, I can recall almost to a "date dot" when the first signs of this extravagant, highfalutin, and pampered era emerged on our humble horizon back in that old Midwest settlement of some time ago. I don't recall that pleasant and innocent and awkward time with any great degree of remorse or wishfulness. No, it's just something else, like looking back as it were to some definite point of departure from one phase or mode of life to another and a new one.

It comes to pass in a sort of imperceptible way, like when you finally grow from a kid in short pants to a young marriageable person planning to conquer your part of the universe and settle down—or even that distasteful period when you begin to get oldish and hate to admit it, or even think of it. So most of us didn't fully realize what we were plunging into back there when we got those three important improvements on our premises—well, maybe it was four of them, if you count the newfangled breakfast food.

They seemed strange enough at first and we were not quite sure what to do with the new things after we got them. I refer to three innovations that blasted us clean out of the old pioneer fumbling era, smack dab into the outer fringes of this extravagant and easy-soft kind of living that everybody takes for granted now.

We got a cookstove for use in summertime which burned kerosene oil. We got ourselves a funny looking wall

telephone with a curving, out-thrusting receiver and a handy crank on the box to ring up central. We had the local plumber put us in a fancy indoor privy. Then, if you count in the corn-flakes and the shredded wheat biscuits for our breakfast fodder, in place of hot oatmeal and cream of wheat porridge or good old cornmeal mush, you have the best of rudimentary evidence. It's all any smart detective would want to solve the guilt pertaining to the shiftless era we had moved right into.

MAYBE you think Ma was the chief beneficiary of that oilstove. She wasn't, because I ask you who was it sawed and chopped and lugged in all the confounded wood that the crazy old cookstove used to consume? Besides, for awhile we used the new oil-burning stove just in summertime out in the lean-to kitchen. It wasn't so miserable to run as a wood-burner with forced drafts during the torrid July days. We fired up the regular cookstove most of the time between November and May.

It worked all right for awhile. We got the new contraption second hand and didn't know much about cleaning burners or such rules, and so one time the blamed gadget blew up with a whoosh and set fire to a mess of batter cakes. As luck would have it, Ma was setting the table and didn't get scorched. Then we sold it to the junk man and waited for a few weeks until we'd saved up enough to get us a brand new oilstove—complete with directions. You see, even an explosion wasn't sufficient to warn us not to go too fast into the new era. We'd had a taste of something different, and I was relieved some from heavy-duty timber chores. So, figuring that kerosene was dirt cheap and wood getting more costly, we launched ourselves for good on the trail of progress.

I can't recollect that the meals Ma fixed up for us were any nicer or tasted any better after she used the oil-burners, but it seemed easier for her anyhow on several counts.

Meantime, Ma didn't yet have running water for cooking and dish washing. She used the old cistern pump at the kitchen sink. We used to smell the water often and when it got pretty foul, we'd grab our ladders and crawl under the house and attempt to clean it out—that is, after a long dry spell when the water line was low.

THAT new telephone was really a needless extravagance, if there ever was one. Except for possibly being able to call the doctor or the veterinary surgeon quicker, that phone represented about as much intrinsic value as a television set does now. Sure, it looked right nice and modern to have up there on the kitchen wall beneath the clock-shelf and alongside the hooks where we hung the almanacs and home-medicine booklets.

I recall the first time I answered that phone was when a neighbor rung us up to say Merry Christmas—or maybe to wish me a happy birthday, one or the other, I forget which. I was scared stiff, as I used to be when they told ghost stories or war yarns. Mr. Haselton's voice didn't sound natural, like it usually did when he just went outdoors at his house and hollered like time over to our place. There was a big echoing hollow place in the valley between us, and sometimes his voice repeated itself so often you never made a mistake about what he wanted. Pa's voice was the largest and most penetrating one in the whole community. Haselton and three other neighbors always heard him plainly—sometimes too much so when he was jawing at me or the dog. So I ask you what did we need a phone for anyhow? Especially, because when Pa used the receiver he didn't tone down his vocality much and it almost tore out the insulation.

But there it was—right on the wall, because the home telephone company wanted subscribers and it would be lots cheaper for more homes to hitch

onto the line. I doubt if it saved us many steps or meant much in a marketing way. We always went downtown twice each week regularly. Ma simply wouldn't order groceries unsight and unseen, and Pa had some old cronies at the lodge hall who liked to play old sledge and pinochle pretty well. So you can't hang that excuse up to the credit of the telephone. However, it didn't cost us much, probably a dollar a month. It usually worked too, except when you forgot to put in the lightning plug before a summer

storm. It's main advantage was at election time. You didn't have to go down to the courthouse chambers and hang around there all evening waiting for the slow telegraph messengers to dawdle in with the dispatches. You could call up somebody every half hour and learn the worst.

But the gadget that broke down the redoubtable fiber of the pioneers and opened a wedge for all the pamperings we have enjoyed was the chemical closet in the corner room, which replaced that bulwark of rugged Americanism—the backyard outhouse. The once famous actor, vaudeville impersonator, and raconteur, Chick Sale, was a sort of neighbor of mine, just about 25 miles away. He it was whose little booklet of the 1920's immortalized the "family-size three-holers."

Like the dogs and cats of those days, the human family always moseyed out into the ozone somewhere for their alimentary chores. Even decrepit grandsires hobbled out back without a murmur of complaint or sign of rebellion—unless ill and bedridden. As Chick reminded us, there was usually a handy woodpile out there near the privy, so that one could render double duty by lugging in a few sticks or kindlings en route indoors from the "necessity."

It usually stood under a shade tree with a few annual wild cucumber vines gracefully entwined around its battlements. Various ornamental moons and crescents were hacked into the rough door for visual and ventilating purposes. The flies of summertime did not bother the users so much as the frigid drafts and heaped snowdrifts of January. Those were the times that tried men's souls and probably led to the surrender of our generation to the self-indulgence of a toilet with less direct rear exposure.

THEN, finally, we got that new kind of morning chow. Father discovered it first, when the grocer unpacked one of the first cases of cornflakes ever to reach our community. I think it was named "Granose." The package looked just like the ones they sell now, but the coupons for prizes and the advertising urges for small boys to partake of flakes so they could become Hopalongs were a much later feature of the dish. It was novel enough to sell itself.

It saved Mother quite a lot of cooking and preparation of gruels and oatmeal the night before. You could just dump the stuff into a cereal dish and sprinkle on the sugar and cream, and then imagine you had something that would stick to your ribs. "Easier to chew and easier to eat." Those longish lumps of shredded wheat also arrived soon after the cornflakes, and they went well with soft-boiled eggs on top. That was also the time when toast began to take a back seat in the day's first meal—but only a few of us could say we saved much by this

(*Turn to page* 48)

Fig. 1. "Starter" fertilizer gets corn off to a vigorous start and in Wisconsin is prerequisite to all other fertilizer treatment. It is especially important that rather liberal applications (200 to 300 lbs. per acre) be drilled in with cornplanter attachment where sidedressing with nitrogen fertilizer is contemplated and especially where no manure or other commercial fertilizer has been applied.

Fertilizing the Corn Crop in Wisconsin

By C. J. Chapman

Soils Department, University of Wisconsin, Madison, Wisconsin

THE average yield of corn in Wisconsin could be doubled if all of our 2½ million acres were given the proper soil and fertilizer treatment, the stands were stepped up to safe limits, and adapted strains of good hybrids were planted.

By soil treatment I mean proper and adequate preparation of seedbed, timely cultivation of the crop for weed control and soil aeration, and the use of adequate amounts of plant food. A mellow, deep, and well-prepared seedbed adequately supplied with organic matter and plenty of plant food is the secret to high yields of corn. The cultivation of our corn at the right time in order to stir the soil for good aeration and as well to form a dust mulch which helps prevent losses of moisture by evaporation is likewise an important factor in the production of good crops of corn.

By "safe stands" I mean the increasing of the number of stalks per acre to a point where over-crowding and moisture limitations do not become depressants. This may mean stepping up

our stands from the old 42″ x 42″ with 3 kernels per hill (which gave us about 10,000 stalks per acre) to stands of from 12,000 to 16,000 stalks per acre.

What About Plant-food Requirements?

Lack of nitrogen is more responsible for poor crops of corn in Wisconsin than is the lack of any other element. But in making this statement I must also say that adequate and abundant supplies of phosphorus, potash, and lime are prerequisite to the full utilization of nitrogen whether supplied in the form of commercial fertilizer or derived from the soil's mineral or organic residue sources.

Let us consider for a minute those fertility factors that combine to give us 100-bushel crops of corn. First of all, corn is a heavy feeder on nitrogen. A 100-bushel crop of corn plus fodder requires about 157 lbs. of this element. Corn is likewise a heavy feeder on potash, a 100-bushel crop requiring about 110 lbs. of K_2O (equivalent to the potash contained in 550 lbs. of an 0-20-20 fertilizer). The phosphorus required for a 100-bushel crop of corn amounts to about 56 lbs. of phosphoric acid (P_2O_5). Manure, we all know, is a wonderful corn fertilizer and 10 tons of it contains about 100 lbs. of nitrogen, 50 lbs. of phosphoric acid (P_2O_5), and 100 lbs. of potash (K_2O). Manure is relatively low in phosphorus and it is for this reason that most of the common "hill-drop" or "starter" fertilizers recommended for corn are relatively high in their content of phosphorus. A lack of phosphorus may result in soft, immature corn. Abundant supplies of phosphorus, potassium, and nitrogen make for good yields of well-formed ears of hard, mature, protein-rich corn.

Build Up High Level Fertility

Soils low in phosphorus and potassium should be given liberal applications of fertilizers at the time of seeding down to small grain and clover or alfalfa. Our soils should be limed and maintained at a pH of 6.5 (very slightly acid). We should aim toward the restoration of the original virgin state of productiveness through this more fundamental practice of soil building. The regular application of fertilizers (about

Fig. 2. Sidedressing attachments for all makes of tractors are available. The application of from 125 to 150 lbs. of ammonium nitrate (or its equivalent in other nitrogen fertilizers) is recommended when corn is about knee-high.

Fig. 3. Here on the Victor Jonas farm at Muscoda, Wis., 67 lbs. of nitrogen (200 lbs. of ammonium nitrate) applied as a sidedressing in mid-July increased the yield of corn from 18 to 57 bushels per acre. "Starter" fertilizer (3-12-12 at 150 lbs. per acre) was applied to the entire field with an attachment on the cornplanter. (Sandy soil—no manure).

300 to 500 lbs. per acre of 0-20-20 or 0-10-30) every rotation plus the top-dressing of alfalfa every fall (or spring) with high-potash mixtures will in the course of several rotations raise the general level of fertility of our farms as a whole. Some farmers may wish to raise the general level of fertility at once by applying up to 1,000 lbs. per acre of 0-20-20 or 0-10-30 and then maintain this high fertility level with the application of smaller amounts of fertilizer every rotation.

Where we have built up and maintained a good level of fertility in our soils by this more general practice of applying fertilizer at the time of seeding down to legumes and where manure is applied and plowed under or disced in for corn, we believe that the practice of hill-dropping or drilling of small amounts of fertilizers with an attachment on the corn planter is about all that is needed to produce these high yields of corn. This small "shot in the hill" can be thought of as "starter" fertilizer. In Wisconsin on our upland silt and clay loam soils we recommend such mixtures as 3-12-12, 4-16-8, or 5-20-20 at from 150 to 300 lbs. per acre. Where corn is checked we suggest not more than 125-150 lbs. in the hill, but where drilled or hill-dropped it is safe to increase the rate of application up to 200 to 300 lbs. per acre. On the dark-colored muck or bottomland soils we recommend high-potash mixtures such as 0-10-30 or 3-9-18 at rates up to 400 lbs. per acre with the attachment on the cornplanter. (On some of the muck soils it may be necessary to plow under or disc in from 200 to 400 lbs. of pure potash in addition to the hill or drill treatment.)

Sidedress Corn with Nitrogen

I have already said that the lack of nitrogen is the bottleneck which over a period of years has held our average yields to about 44 bushels per acre. Nitrogen fertilizer applied as a sidedressing at the time of the second or third cultivation has produced some amazing and spectacular increases in yields. Thousands of farmers in the Midwest are now following this practice of sidedressing their corn early in the growing season.

Fig. 4. A sidedressing of 45 lbs. of nitrogen in the form of calcium nitrate applied on July 16 raised silage yields from 16,000 to 25,000 lbs. per acre on the Jos. Sharratt farm at Mazomanie, Wis. (Other carriers of nitrogen such as ammonium nitrate, ammonium sulphate, cyanamid, or urea might have been used with equally good results).

It is true that even where we have raised the general level of fertility in our soils through the continued application of phosphate and potash fertilizers and where our soils have been adequately limed, the lack of nitrogen may still be the cause of low yields of corn. Where a good legume sod is plowed under and where manure is generously applied, the only fertilizer we recommend is "starter." But where corn follows corn or grain and where we know the soil is short on nitrogen (the element that gives us the dark-green, lush growth of stalks), this sidedressing of corn with nitrogen fertilizer at the time of the second or third cultivation offers a great opportunity for larger yields on our Wisconsin farms. In fact, I predict that the sidedressing of corn with nitrogen will do more to increase yields than any practice ever recommended.

On fields that will make, let's say, 50 to 60 bushels per acre and where in previous years lime and commercial fertilizers were applied at the time of seeding down, the application of 125 to 175 lbs. per acre of ammonium nitrate or its equivalent in other forms of nitrogen fertilizer, such as ammonium sulfate, cyanamid, nitrate of soda, or urea, will result in increases of from 15 to even 25 bushels more corn per acre.

Closer Planting Requires More Plant Food

In order to achieve these higher yields, we are finding it necessary to plant more corn per acre. This stepping-up of stands can be accomplished by narrowing our planter wheels to the 38″ or 40″ and then hill-dropping 2 to 3 kernels in spacings from 22″ to 28″ in the row. On sandy soils we must be careful not to plant corn too thick on account of moisture limitations. However, there is more corn "firing" for a lack of nitrogen than for a lack of water. But closer planting, more stalks per acre, calls for more plant food. This yellowing and "firing" of the lower leaves of corn in mid- or late summer are the telltale symptoms of the almost universal lack of nitrogen. Many farmers in the past have mistaken this drying-up of lower leaves for a lack of water.

What about attachments for tractor cultivators with which to apply fertilizer? Practically all the manufacturers of farm tractors are making these attachments. Prices range from $85 to $100 for the two-row attachments. The fertilizer is placed back of the inside shovels in bands on either side and at a distance of from 8″ to 12″ from the corn row.

The Best Time to Sidedress

Due to possible moisture limitations later on in the growing season in Wisconsin, we think it is best to apply nitrogen fertilizer in the early period of the growing season (late June or early July). It is true that excellent results have been secured where nitrogen fertilizer was applied even up to the first of August, even when corn had started to tassle. But in general it should be applied before the corn is knee-high. Bear in mind that sidedressing corn in late June or early July is not a substitute for the application of "starter" fertilizer at the time of planting. The practice of hill or drill fertilizing is still strongly recommended.

What about those low-fertility fields where manure is not available and where no clover or legume sod is being plowed under? I have already stated that the average yield of corn in Wisconsin is about 44 bushels per acre. In this average of 44 bushels per acre we include thousands and thousands of acres that made yields of 20, 25, 30, and 40 bushels per acre. There are thousands of acres of corn planted every year where manure is not available and where no commercial fertilizer has ever been applied in the rotation. Why not give such fields a complete balanced fertilizer as a substitute for stable manure? In my opinion 10-10-10 (or 8-8-8) is a well-balanced plant food and where plowed under at from 800 to 1,000 lbs. per acre with crop residues will supply approximately the same amount of plant food as is contained in 8 to 10 loads of "phosphated" manure. (By "phosphated" I mean manure to which 25 lbs. of 20% superphosphate have been added to each ton.)

It is true that the 10-10-10 or 8-8-8 grade of fertilizer does not meet the requirements of corn on all types of

(*Turn to page* 44)

Fig. 5. Here, 800 lbs. of 8-8-8 applied on the furrow bottom plus "starter" fertilizer (2-12-6 in the hill) made 108.7 bushels per acre. "Starter" only made 76 bushels. This crop was planted thick (about 14,000 stalks per acre) and was grown on the Paul Bartels farm in Grant County, Wis. No manure was applied to this field.

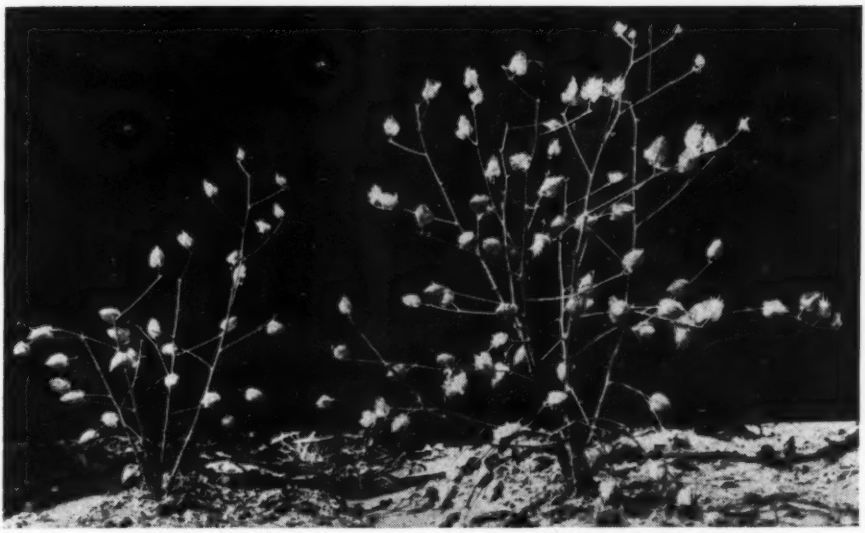


Fig. 1. Nitrogen made this difference, but to realize the maximum benefit from nitrogen, it is necessary to follow a sound insect control program. Left—no nitrogen. Right—adequate nitrogen. Adequate quantities of phosphorus, potash, and lime were applied in both instances.

Increasing Cotton Yields in North Carolina

By C. D. Welch and W. L. Nelson

Agricultural Experiment Station, University of North Carolina, Raleigh, North Carolina

COTTON is in the spotlight again, primarily because of the increased demand for this crop and its low production in 1950. Unfavorable weather conditions along with a severe insect infestation have been blamed for the low yields in North Carolina. However, it is interesting to note that many farmers obtained relatively good yields in 1950 by following recommended production practices.* These practices included the use of proper amounts of lime and fertilizer, the control of insects and diseases, the use of recommended cultural practices, and the planting of an adapted variety at the correct seeding date.

This article will deal primarily with recent research relating to nitrogen fertilization and spacing. Certain information on phosphorus, potash, and lime requirements will be mentioned.

Nitrogen Fertilization

An adequate supply of nitrogen throughout the growing season is an

* Kulash, Walter M., and Jones, George D. Cotton insect control in North Carolina, N. C. Extension Circular 312. March 1950 (revised).
Shanklin, J. A., et al. Seven steps to efficient cotton production, N. C. Extension Circular 345. January, 1950.

important factor in producing high cotton yields (Figure 1). A crop of cotton yielding two bales of seed cotton per acre will contain about 110 pounds of nitrogen, of which 60 pounds are in the seed cotton (Table I). Most soils in the cotton-producing areas of North Carolina are low in available nitrogen and nitrogen must be supplied if high yields are to be obtained.

TABLE I.—POUNDS OF NITROGEN, PHOSPHORIC ACID, AND POTASH PER ACRE IN A TWO-BALE CROP OF COTTON (APPROXIMATE AVERAGE COMPOSITION).

	N	P_2O_5	K_2O
	Lbs.	*Lbs.*	*Lbs.*
2 bales of seed cotton....	60	25	30
Plants (3000 lbs. air dry).	50	15	50
Total (per acre).....	110	40	80

There are certain hazards which must be recognized when applying high rates of nitrogen for cotton. Any condition that will cause the squares or young bolls to shed will allow the cotton plant to make greater vegetative growth provided the supply of nutrients and other conditions are favorable. Often excessively wet weather may cause square shedding. Early insect damage may also cause a poor "boll set." It is essential that good insect control practices be followed if maximum returns are to be realized from cotton fertilization, especially from sufficient nitrogen to produce 1½ to 2 bales per acre.

Nitrogen-deficiency symptoms: Nitrogen deficiency on cotton is shown by light green leaves, which later turn yellow, then red, and eventually shed. This is very common, particularly on sandy soils in early August. In some instances, premature leaf shedding is considered an advantage in order that opening will be hastened and picking made easier. However, the leaves are on the plant for the purpose of manufacturing carbohydrates, important constituents of the cotton lint. Hence, early leaf shedding may result in many partially developed bolls, poor quality lint, and low yields. The practice of artificial defoliation permits the grower to supply sufficient amounts of plant nutrients to keep the cotton leaves functioning until the desired time to remove them.

Time of nitrogen application: Experiments have shown that around 20 pounds of nitrogen (N) per acre should be applied for cotton at planting. This aids the plants in getting an early start and prevents early nitrogen deficiency which may "stunt" the plants. This "stunting" may reduce the yield potential even though the nitrogen supply is adequate during the period of boll formation.

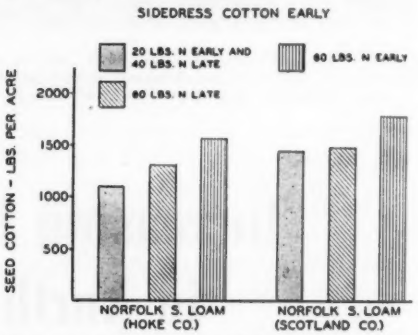


Fig. 2. Early nitrogen sidedressing is important in obtaining maximum benefit from the fertilizer applied. Twenty pounds of nitrogen, 80 pounds of P_2O_5, and 80 pounds of K_2O per acre were used at planting in all treatments. The early sidedressing was applied when the cotton was 6-8 inches tall. The late sidedressing was applied when the cotton was 20-24 inches tall.

The nitrogen sidedressing should be applied early so as to be effective before that applied at planting is exhausted. Experimental data shown in Figure 2 indicate that the best time to sidedress is when the plants are 6-8 inches tall. Results from two locations show that late applications of nitrogen were not effective in producing maximum yields. In these experiments, 20 pounds of nitrogen and adequate phosphorus and potash were applied in bands at planting.

Rate of nitrogen application: Studies conducted in North Carolina show

increased cotton yields with increasing rates of nitrogen up to 80 pounds per acre. Some of the results obtained in 1948 and 1949 are given in Figure 3. Twenty pounds of nitrogen per acre were applied in bands at planting, along with adequate phosphorus and potash. The remainder of the nitrogen was sidedressed when the plants were 6-8 inches tall. The effect of nitrogen was similar both years except for the reduction from the 120-pound rate in 1949. Excessive rainfall, especially during July and August, provided less favorable conditions for the production of high cotton yields in 1949. Despite the lower yield level in 1949, the yields of seed cotton were increased with rates of nitrogen up to 80 pounds per acre.

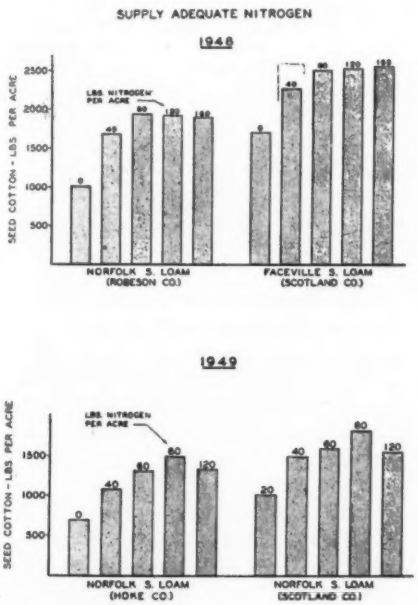


Fig. 3. Seed cotton yields were increased with rates of nitrogen up to 80 pounds per acre in experiments conducted in 1948 and 1949, (80 pounds of P_2O_5 and 80 pounds of K_2O were applied at planting in all treatments).

In general these and previous experiments show that from 40-80 pounds of fertilizer nitrogen are necessary to produce 1½ to 2 bales of cotton on average cotton soils. This is in general agreement with the results obtained in South Carolina at the Pee Dee Experiment Station. The results of a 16-year study have shown that approximately 60 pounds per acre of nitrogen are required for maximum yields of cotton.** The amount of nitrogen needed is of course greatly influenced by the soil and its previous treatment. On dark soils or where cotton is following legumes, the amount of sidedressing should be reduced or omitted entirely.

The nitrogen may come from several sources—the soil, cover crops, or commercial fertilizer. Unless the cotton is grown after legumes are turned under or on dark soils which will furnish some nitrogen, a high yield cannot be expected without an adequate application of nitrogen fertilizer.

As mentioned previously, an important factor in obtaining profitable returns from high amounts of nitrogen is to get an early set of bolls. A plant that is not setting many bolls tends to grow large. Early planting and early dusting greatly aid in early fruiting.

Effect of cover crops: The effect of cover crops on cotton yields was studied during the period from 1945-48 on a Marlboro fine sandy loam soil in Edgecombe County. Legume cover crops furnished adequate nitrogen for the yields obtained in this experiment (Figure 4). However, when sufficient fertilizer nitrogen (80 pounds per acre) was applied for the cotton grown on no-cover plots, the yields were as high as those obtained with cover crops. This indicates that the main effect of cover crops in this experiment was due to the nitrogen supplied.

Sidedressing 40 pounds of nitrogen after turning under vetch or Austrian winter peas reduced yields. This additional amount of nitrogen encouraged a greater vegetative growth and reduced fruiting. With oats, 40 pounds of nitrogen applied for the cotton were

** Hall, E. E., and Harrell, F. M., Fifty-seventh Annual Report of the South Carolina Experiment Station (1945), pp. 90.

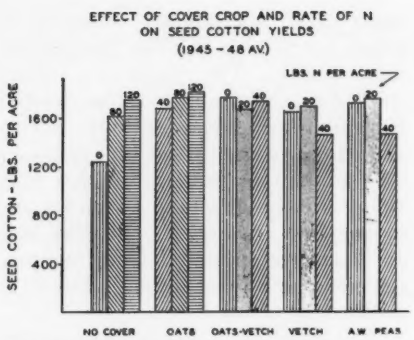


Fig. 4. A good growth of a legume cover crop or commercial fertilizer nitrogen will supply nitrogen for profitable cotton yields, (60 pounds of P_2O_5 and 120 pounds of K_2O per acre were applied at planting in all treatments).

adequate. It should be mentioned that the oats were topdressed with 18 pounds of nitrogen per acre each year.

Phosphorus, Potash, and Lime Requirements

The phosphorus, potash, and lime requirements of cotton have received considerable attention in experimental programs for a number of years.

Phosphorus: An adequate supply of phosphorus is important in rapid development of cotton. The response to phosphorus is of course related to the amount of this nutrient in the soil (Table II). On most Coastal Plain soils, 50 to 60 pounds of P_2O_5 per acre are adequate, while Piedmont soils may require from 75 to 100 pounds.

TABLE II.—EFFECT OF PHOSPHORUS APPLICATIONS ON YIELDS OF SEED COTTON (1948)*

P_2O_5 applied lbs./A	Yield of seed cotton—pounds per acre	
	Norfolk sandy loam 67 lbs./A of P_2O_5 in soil	Norfolk sandy loam 288 lbs./A of P_2O_5 in soil
0	1439	2049
50	1929	2335
100	2048	2432

* 60 lbs. of N and 80 lbs. of K_2O applied per acre.

Potash: Cotton is considered to be a relatively weak feeder for potash, and "rust," or potash deficiency, is common on soils low in potash. The amount of potash needed in the fertilizer is related to the level of potash in the soil. Examples of the response of cotton to potash are shown in Table III. In general 30 to 40 pounds of K_2O are adequate on average soils while 60 to 80 pounds of K_2O are required on low potash soils or when cotton is grown in rotation with crops removing high amounts of potash.

TABLE III.—EFFECT OF POTASH APPLICATIONS ON YIELDS OF SEED COTTON (1944-6 AVERAGE)*

K_2O applied lbs./A	Yield of seed cotton—pounds per acre	
	Norfolk sandy loam low in potassium	Cecil gravelly loam medium in potassium
0	863	1778
30	1411	1819
60	1734	1835
90	1710	1993

* 35 lbs. of N and 50 lbs. of P_2O_5 applied per acre.

Fertilizer placement: It is essential that the fertilizer used at planting be placed so as to avoid injury to the germinating seed and young seedlings. A vast amount of experimental work has been conducted for many years throughout the Cotton Belt to determine the proper placement of fertilizer. On the basis of this work, it is recommended that the fertilizer be placed in bands three inches to the side and two inches below the seed. Suitable equipment which distributes fertilizer and plants simultaneously is generally available.

Lime: Last, but not least, broadcast applications of dolomitic limestone are necessary on some soils to supply adequate calcium and magnesium. Cotton seedlings grown on acid sandy soils

(*Turn to page* 43)

Fig. 1. Carrots—55, no treatment; 58, fertilizer only; 61, lime only; 65, 67, and 69, increasing amounts of lime with fertilizer.

Know Your Soil

VIII Penn Silt Loam

By J. B. Hester, F. A. Shelton, and R. L. Isaacs, Jr.

Department of Agricultural Research, Campbell Soup Co., Riverton, New Jersey

THE Piedmont Plateau lies slightly west of the Coastal Plain and extends from southeastern New York to Alabama. The soils on this plateau are derived primarily from ancient crystalline rock. Among the soils in this section is the Penn series. Better than one million acreas of land in New Jersey and Pennsylvania have been characterized as the Penn series, which makes it an important soil.

This soil in its native state of development is low in fertility. The soil reaction or pH value is below 5.5. The organic matter content is low and the plant nutrients, particularly calcium and magnesium, are insufficient to supply the crops that are valuable for animals. Since this acreage of soil is so tremendously important for the production of food for the cosmopolitan area of New Jersey and Pennsylvania, considerable research has been conducted upon it. Likewise, very outstanding accomplishments have been achieved by growers following the findings of this research.

Figure 1 points out some of the limiting factors of this soil in the production of carrots under controlled greenhouse conditions. Number 55 represents the maximum carrot-producing power of this soil without any treatment. Number 58 represents the same soil with an application of 1,000 pounds of 5-10-10 acid-forming fertilizer per acre. Number 61 represents this soil in which the calcium and mag-

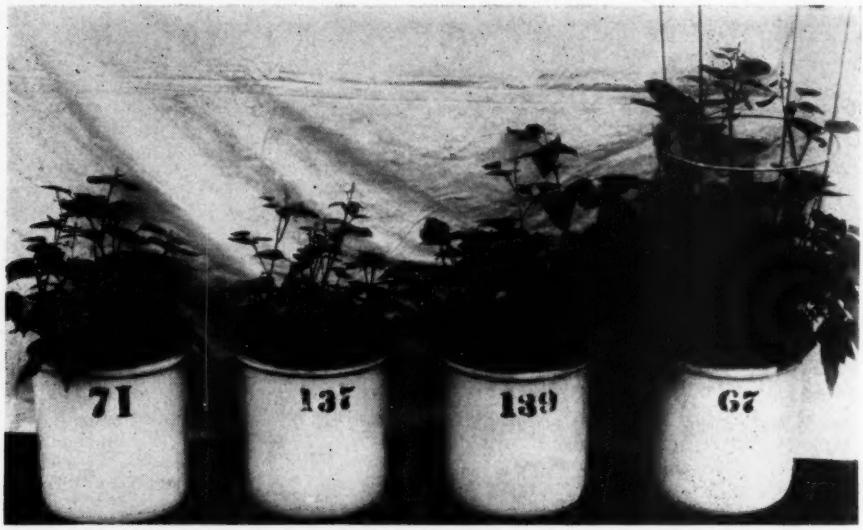


Fig. 2. Lima beans—Pot 71, no treatment; 137, fertilizer only; 139, lime only; 67, fertilizer, lime, borax.

nesium requirements have been satisfied. Numbers 65, 67, and 69 represent the fertilizer requirements of the soil being satisfied and the amounts of lime increased. From this experiment it is perfectly obvious that the first limiting factor of the native Penn silt loam is adjusting the pH factor and supplying sufficient calcium and magnesium for the crop concerned. Then the fertilizer and secondary elements can function properly.

To carry this point further, Figure 2 is given to show the production of lima beans. Pot 71 had no treatment, 137 received fertilizer only, 139 received lime only, and 67 received the proper application of fertilizer with the soil

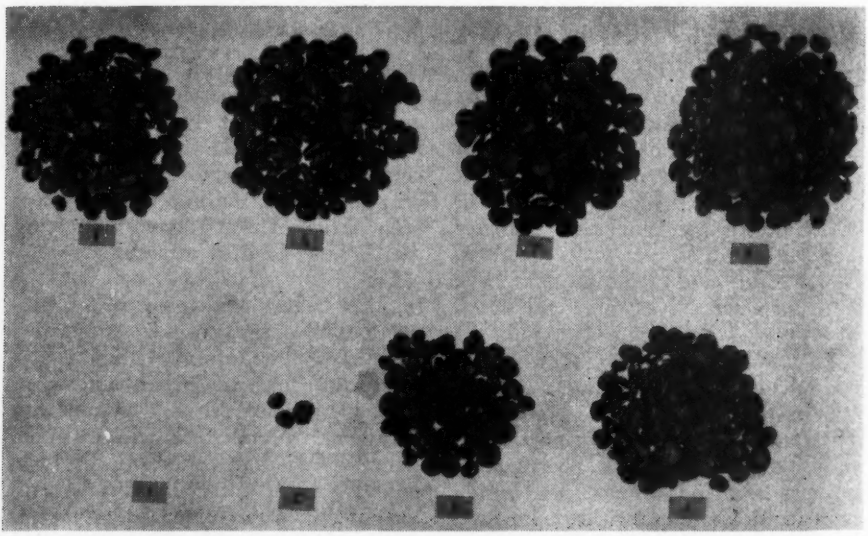


Fig. 3. Lima beans—No. 1, pH 4.9. Lime increased to pH 6.8 with uniform application of fertilizer.

Fig. 4. Carrots—Optimum lime on all. No. 1, no nitrogen; 2, no phosphorus; 3, no potash; 4, complete mixture.

limed and borax added to produce maximum crop yields.

Since the most limiting factor in this soil was lime, it was decided to find out what the effect of the application of different amounts of lime or the change in pH value would be when a uniform application of fertilizer was used (in this particular case 1,000 pounds of 12-24-24 per acre). As shown in Figure 3, starting with Treatment 1, there was a pH value of 4.9 and no yield was produced. As the pH value of the soil progressed to 6.8, due to the application of liming materials, the yield of lima beans increased.

(*Turn to page* 48)

Fig. 5. Five-year experiment. Pot 41, grower's treatment; 49, experimental area—both with no additional treatment. Pot 51, grower's treatment; 60, experimental area—both with additional fertilizer.

A Look at Alfalfa Production In the Northeast

By J. B. Washko

Department of Agronomy, Pennsylvania State College, State College, Pennsylvania

ALFALFA is the queen of our forage crops. It has been passed on to us as was our culture by ancient peoples. The Greeks, Romans, Russians, Arabians, and other early people grew this plant for its forage. Its very name "alfalfa" is from the Arabic and means "the best fodder." Today, it is still recognized as more nearly the perfect forage of any available. As hay, it is unsurpassed for livestock feeding. As pasture, it has a high carrying capacity and produces large gains when properly managed. It makes excellent silage when properly handled and makes good feed whether chopped or ground into meal. Its nutritive value is high since it is a valuable source of energy, carotene riboflavin (Vitamin G), protein, and calcium.

In addition to these virtues, there are other definite advantages in growing alfalfa. It assures hay in dry years. While it has a high water requirement, its deep tap root system can siphon water out of the soil that is beyond the reach of other forage species. This deep penetration of its roots system also enables alfalfa to recover from the subsoil plant nutrients which have leached there or are naturally present therein. The fact that two or more cuttings of alfalfa can be obtained per season spreads the risk of hay losses due to inclement weather. If properly managed and fertilized, it will endure 3 to 5 years or more.

Not only is alfalfa an excellent forage crop but when adequately fertilized with minerals, it can be regarded as a soil-improvement crop. It is one of the most vigorous fixers of atmospheric nitrogen that is available to the farmer. Experiments have indicated that under favorable conditions, alfalfa can fix up to 140 pounds of nitrogen per acre annually. But since two-thirds of this nitrogen is removed in the hay, only about 45 pounds of it are accumulated annually to enrich the soil. It would cost a minimum of $5.40 to purchase these 45 pounds of nitrogen if they were obtained from commercial sources. Indirectly, alfalfa culture can be credited with raising the general level of soil fertility on farms because large quantities of nutrients must be added in the form of calcium, phosphorus, and potassium for establishment and maintenance of stands.

Why the Small Acreage?

Putting all these reasons together, one wonders how any livestock farmer can get along without alfalfa in his farm program. The acreage of alfalfa in the 12 Northeastern States for the 10-year period of 1936-45 approximated 903,000 acres. During the two years of 1947 to 1948, it dropped to 852,000 acres. The total land area in the Northeast devoted to the production of hay approximates 8,156,000 acres. Thus, approximately 10% of this hay acreage is in alfalfa. This does not include the acreage in which alfalfa forms part of the grassland mixture since such acreage data are unavailable.

Why then, isn't more than 10% of our potential hay acreage in the production of alfalfa? What has limited its

expansion? Historically, alfalfa, like most immigrants from Europe, landed on the East coast but it didn't stick except in the area near Syracuse, N. Y. The introduction that did make the United States the leading alfalfa-growing region in the world was that made on the West Coast. This would leave one to believe that the alfalfa plant was in harmony with such an environment as found in the West and conversely, that the Eastern environment is found lacking.

Examination of the facts indicates that such is the case. The soils in the East are generally acid, lacking in the basic materials, lime and mineral nutrients, whereas the soils in the West are high in basic mineral nutrients and are not leached out by the abundant rainfall so common to the East. Many Northeastern soils do not have proper drainage, and so subsoil moisture is often a problem. The soils in the West generally possess excellent drainage, especially in terms of the limited rainfall. The Northeast has less solar radiation whereas the West glories in its abundant sunshine. The alfalfa plant can make good use of abundant solar energy for the manufacture of large amounts of food reserves which are so essential for its survival. Northeastern winters are severe on large crowned herbaceous plants due to the high moisture content of soils and their alternate freezing and thawing. These and other unfavorable factors associated with abundant rainfall and inadequate surface drainage during the fall and spring are hard on alfalfa survival. Likewise, under humid Eastern conditions, disease and insect problems are more severe.

Since the Northeastern environment is so much less favorable than that of the West for alfalfa culture, greater attention must be given to the various factors associated with alfalfa production to overcome these environmental handicaps. What are the problems faced in alfalfa culture within the area and how can they be overcome?

Establishing Stands

There are still too many seeding failures with alfalfa in the Northeast. In this connection, the site chosen for

Fig. 1. Alfalfa is unsurpassed as a hay plant.

alfalfa production merits special consideration. Alfalfa culture should be confined to the better classes of soils. Deep soils are highly desirable. Good drainage is a "must" for alfalfa. It cannot stand wet feet, and unless internal soil drainage is satisfactory, stands will be short-lived.

It should follow a cultivated crop in the rotation to minimize competition from weeds. Such cultivated crops as potatoes, corn, canning tomatoes or peas, or tobacco are desirable preceding crops. The residual fertilizer from these heavily fertilized preceding crops can be utilized to advantage by the alfalfa plant.

Alfalfa requires a properly prepared, firm seedbed. Caution should be exercised, however, not to overwork the seedbed because then the surface crusts and packs. This reduces water intake and also increases the danger of runoff and erosion. The surface should be left with moderate amounts of small clods or lumps, being somewhat loose at the surface but firm below.

Time of Seeding

Time of seeding is another important consideration. In the warmer areas of the Northeast, a choice of either late summer or spring seeding can be made; in the colder portions of the area, only spring seedings are advocated. August seedings are highly successful if moisture is ample since the seedlings can become well established by winter. Late summer seedings, however, are subjected to severe competition from chickweed in areas where this pest abounds. August seedings are usually best from the standpoint of getting desirable hay yields the following season. Excessive moisture, inability to prepare a proper seedbed early, weed competition, and the pressure of other spring work are obstacles to spring seeding.

Should a nurse crop be used or is it better to seed alone? Oats are the most common nurse crop planted with alfalfa in the spring and yet they are one of the poorest from the standpoint of offering too much competition and shading. Spring barley is a better nurse crop where it can be grown. Competition from the nurse crop can be minimized by seeding at only one bushel per acre. If oats are to be used as a nurse crop, in addition to light seeding, an early maturing, short, stiff-strawed variety of the Clinton type should be used.

Seeding alfalfa in winter grains already established offers some possibilities. Alfalfa seeded in small grains in March or early in April on the surface of the soil is usually a waste of seed. The application of 400-500 pounds per acre of a 5-10-10 fertilizer in the spring on the small grains to be followed by breaking up of the soil crust with a weeder and seeding with a cultipacker seeder looks promising. The complete fertilizer also supplies nitrogen for the small grain crop.

High-quality seed of improved varieties such as Ranger, Buffalo, or Atlantic that have proven adapted to the region should be used. Certified seed is preferred. Inoculation of seed should be practiced even though alfalfa has appeared in the rotation previously. This is because too often soil conditions become unfavorable for multiplication of desirable bacteria. By re-inoculating, more efficient nitrogen fixation is assured.

Seeding Technique

Too many fields of alfalfa fail to become established because of improper seeding technique. Seed of alfalfa is frequently buried too deep; ¼ to ½ inch is sufficient. A combination cultipacker seeder is one of the best pieces of equipment available for getting this seeding job done properly. Cultipacking in one direction and then seeding and cultipacking in the other are desirable. If a cultipacker seeder is unavailable and the seeding attachment on the grain drill is to be used, the seeding tubes should be pulled out of the fertilizer and grain tubes to allow the seed to fall behind the shoe or disk to

Fig. 2. Alfalfa and bromegrass are a popular hay combination in the Northeast.

prevent deep coverage with cultipacking or rolling to follow.

Should alfalfa be seeded alone or in grass mixtures? If the alfalfa is to be grown for hay exclusively, then seeding alone is preferable. However, where silage and grazing are also desired, alfalfa-grass mixtures can be used to better advantage. When seeded alone, approximately 15 pounds of seed per acre are used; in grass mixtures 8 pounds of alfalfa seed seem adequate. Bromegrass teams well with alfalfa; timothy also has a place in short rotations with alfalfa. An orchardgrass-alfalfa mixture makes a desirable grass silage or grazing combination but is an undesirable hay mix. The advantages of alfalfa-grass mixtures merit attention. They are: (1) Soil conditions can be somewhat less favorable; (2) the alfalfa furnishes the grass with nitrogen; (3) on rolling lands, better erosion control is obtained; (4) the mixture helps cut down heaving damage; (5) it reduces hazard of bacterial wilt; (6) it minimizes chances of seeding failure; (7) herbage can be used either as hay or pasturage; (8) the mixture allows stands to stay longer—even after the alfalfa goes out, by the addition of nitrogen fertilizer, production can be maintained for an additional one or two years; and (9) hay yields are approximately as high as for alfalfa alone.

Meeting Fertility Requirements

Alfalfa is a heavy feeder on plant nutrients. Successful alfalfa culture, therefore, depends upon the maintenance of the soil at a high level of fertility. A three-ton alfalfa crop removes approximately the following amounts of nutrients from an acre of soil annually: 36 pounds of P_2O_5; 135 pounds of K_2O; 150 pounds of CaO; 50 pounds of MgO; 14 pounds of sulfur, as well as small amounts of boron, manganese, zinc, iron, copper, and molybdenum.

Fertilization of alfalfa should be considered in two phases: (1) Before seeding and (2) maintenance applications. For best alfalfa growth, the soil pH should be maintained at 6.5 to 7.0. On highly acid soils the lime should be applied to the preceding crop or several months before seeding; light applica-

tions can be applied at seedbed preparation. Caution should be exercised, however, to prevent overliming since this may lead to deficiencies of boron and manganese. On soils low in available nitrogen, 700-800 pounds of a 2-12-12 fertilizer or its equivalent can be used to good advantage at planting. The small amount of nitrogen helps the seedlings get off to a better start. On soils with ample nitrogen levels but low in boron, 400-500 pounds of an 0-19-19 fertilizer with 5% borax should be used; on soils not deficient in borax, the same amount of an 0-20-20 fertilizer would be satisfactory.

Such applications of 0-1-1 fertilizers are adequate for establishment, but indications are that they do not meet the needs of the alfalfa plant for maintenance because the plant requires greater amounts of potash. Recent work[1] at the New Jersey Agricultural Experiment Station suggests that a 0-1-3 ratio fertilizer for maintenance more nearly meets the mineral requirements of this plant. The highest yields and longest-lived stands were obtained where 60 pounds of P_2O_5 and 180 pounds of K_2O were applied annually. Early spring applications of P_2O_5 and K_2O were found to be more effective than applications after the first crop had been removed.

As regards the minor elements, boron is required by many Northeastern soils for successful alfalfa production. Annual applications of 20 pounds per acre of borax generally are sufficient. Molybdenum may also be deficient in many alfalfa soils as indicated by recent work by Dr. Firman Bear at New Jersey. Just which of the other minor elements need be added is unknown for most areas. The difficulty encountered in maintaining alfalfa stands on soils previously having grown alfalfa for long periods may be attributed in part to depletion of some of the minor elements now not considered critical in alfalfa culture.

1 Bear, F. E., and Wallace, A. N.J. Agr. Exp. Sta. Bul. 748, 1949.

Maintenance of Stands

The life expectancy of alfalfa stands in the Northeast varies from 2 to 5 years. Depletion of essential nutrients, mismanagement, winter-killing, weed competition, and incidence of diseases and insects all take their toll of plants. If alfalfa is cut for hay, cutting treatments should be practiced so as to allow replenishment of root reserves. This means taking the first cutting off at about 1/10 bloom, the second and third cuttings (where third cuttings are possible) when the alfalfa is approaching full bloom. The last cutting should be made from four to six weeks before the normal date for the first killing frost in order to permit ample time for storage of root reserves and to allow the plants to go into the winter with 6 to 8 inches of top growth. This vegetation acts as a mulch which not only protects against cold, but helps accumulate snow cover, and reduces heaving damage.

How should alfalfa and grass mixtures be managed when cut for silage and grazed? For silage, alfalfa-grass combinations should be cut when the alfalfa is in bloom. When the alfalfa is in bloom, orchardgrass growing with it is at full bloom at the first harvest. If the accompanying grass is brome, the bromegrass is just beginning to head. If the alfalfa is to be grazed, it is best to wait until the alfalfa begins to bloom irrespective of the stage of maturity of the grass, and then it should be grazed rotationally. Grazing should not be extended beyond the first week in September. Grazing is known to be hard on alfalfa but the plant has been kept in mixtures five years by this system of management in experiments conducted at State College, Pa.

Invasion of weeds into alfalfa fields can be minimized by promoting thrifty, vigorous growth in alfalfa and maintaining good stands. Keeping the competitive advantage in favor of the alfalfa gives weeds little chance for invasion. Chickweed, which is becoming

(*Turn to page* 46)

Clinics for Sick Soil

By N. M. Coleman

Columbia, Missouri

FARMERS in Missouri can just about write their own ticket when it comes to building up and maintaining their soil fertility. Sixty-nine county soil-testing laboratories have been set up over the State by the Extension Service of the College of Agriculture.

No longer can a Missouri farmer blame the weather for poor crops, or excuse feeble yields because of having planted in the wrong time of the moon. Now he can be "in the know" regarding the plant-food needs of his different fields.

For a reasonable charge, usually less than 15 cents an acre, he can take soil samples to his county agent and have them tested for organic matter, soluble phosphate, exchangeable potassium, magnesium and calcium, and the pH or acidity. By these tests, and the information about recent crops and soil treatments, the county agent can more accurately determine the amounts of the different plant foods that will be released to certain crops grown on different kinds of soil. Once he knows this, and the amount of plant food added in the form of green or barnyard manure, he can determine what fertilizers should be applied to attain the desired yields.

Fig. 1. O. T. Coleman, Extension Specialist in Soils, demonstrates the proper methods of taking soil samples to represent the surface seven inches of each kind of soil in a field. Samples may be taken with a spade, a soil auger, or a sampling tube.

In the laboratories are technicians who carry out the soil-testing procedures, adjust, care for, and read the complicated instruments such as the photo-electric colorimeter and the lime-meter. Strangely enough, they need know little of chemistry to do this. Like the bride baking her first cake, they work by the cookbook method—a recipe procedure based on steps 1, 2, and 3. The county agents, however, are responsible for the training of these technicians and checking their work. In every case the agents are responsible for interpreting the tests and making recommendations.

To take advantage of this service a farmer needs only to take a sample of soil to his county agent, give him the needed information of how it's been handled and treated, and tell him the crops or rotations he wishes to follow. The soil sample should represent the

surface 7 inches of each different soil in the area on which a test is desired.

A composite sampling of about 10 borings 7 inches deep from each different kind of soil in the field to be tested should be taken. These borings should be thoroughly mixed, preferably in a bucket or small box, then about a teacupful of this mixture taken to the soil-testing laboratory. The mixture must be air-dry in order to get an accurate test. For this reason samples should be taken at least a week before testing. Artificial heat should not be used in drying samples. If the temperature is high enough to brown a white paper napkin, it may affect the test. Air circulated at room temperature by means of an electric fan is the best method for drying samples. Testing is best done when the soil is in good condition for plowing. A field need not be tested more often than every 4 or 5 years.

Figures prove that this soil-testing service is welcomed by the farmers. In 1946, the first year of operations, three laboratories were set up, and these centers handled approximately 9,000 tests. Last year, 69 laboratories took care of 67,000 tests.

Farm women are making use of these soil clinics by bringing samples from their gardens. Women's Clubs over the State are encouraging this practice because garden soil needs to be richer than other soil on the farm.

Oliver Miller of Davies County produced a record corn yield of 157.7 bushels per acre in 1950. "I've used fertilizers for years," he says, "but I notice a difference when I got it balanced. I found that applying fertilizers according to soil tests eliminates waste." He suggests five steps in getting higher yields.

1. Have soil tested.
2. Apply fertilizer as recommended by county agent.
3. Plow under a green manure crop with the fertilizer.
4. Vary planting rate according to fertility level.
5. Control weeds.

A farmer in Southeast Missouri says he had better cotton last year where he fertilized according to recommendations than he had ever grown. And this despite the wet and unfavorable growing season. His cotton was 10 days earlier on tested soil—an impor-

(*Turn to page* 46)

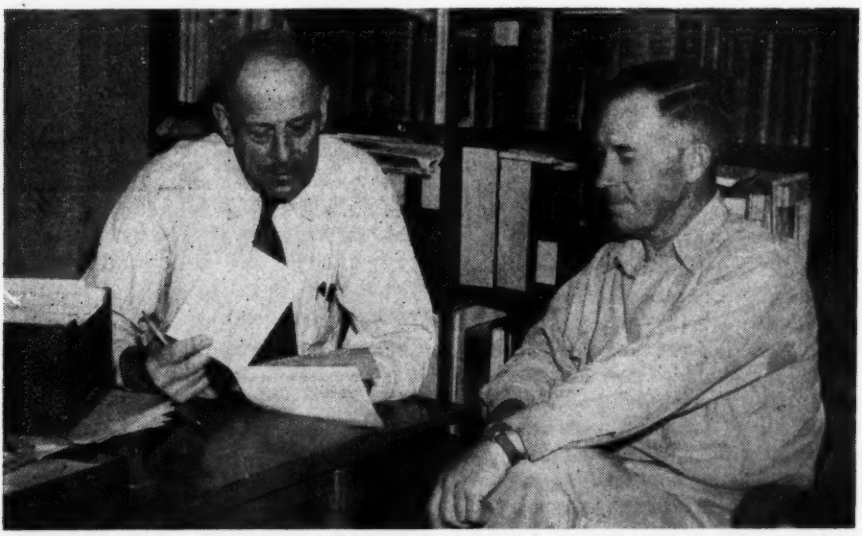


Fig. 2. In Boone County, T. A. Ewing, County Agent, makes recommendations based on soil tests made in the laboratory.

Meeting the Cotton Goal

By Claude L. Welch

National Cotton Council, Memphis 1, Tennessee

RECOGNIZING that this nation and its allies would need every pound of cotton that could be produced in 1951, the Secretary of Agriculture last fall announced a goal of at least 16 million bales for this season. Everyone concerned in this tremendous undertaking realizes it is a job that will demand the utmost in cooperation, hard work, and utilization of resources. Leaders in both industry and government, however, believe the American farmer will rise to the occasion. That conviction remains unshaken on the basis of a painstaking appraisal of the assets and liabilities in the production picture.

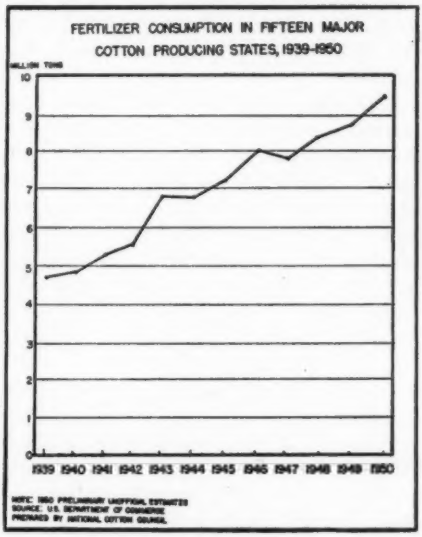
It is true that, in meeting their goal of 16 million bales, farmers will be confronted with the many shortages and restrictions imposed by a near wartime economy. On the other hand, from many standpoints, the Cotton Belt in 1951 is in better position to meet such a production goal than at any time in its history.

At the outset, in any analysis of our production possibilities for 1951, we all recognize that the weather which will prevail throughout the season will be one of the most important single factors. We can only hope and pray that it will favor the cotton farmer. There are, however, some tangible assets that will serve us in good stead as we strive to meet our goal.

Between 28 and 30 million acres of land suitable for cotton are available for planting this season. In 1949 a 16-million-bale crop was produced on 27.2 million acres.

Cotton production is more highly mechanized than ever before. There are more tractors and farm equipment on farms.

Cotton farmers are using more fertilizer and insecticides than ever before.



These, briefly then, are the big assets in the 1951 cotton production effort—available acreage, more machines, inclination of farmers to use more fertilizer, and to control insects more thoroughly.

It is foreseeable that the demands of industry, as mobilization for defense is stepped up, may result in shortages of the labor and materials cotton farmers will need for all-out production. In such an event they will not be able to get all the workers they will need and may not be able to obtain as much machinery, fertilizer, and insecticides as they would like to have.

Of these prospective shortages, that of labor looms as the most critical. In the South the number of farm workers in 1950 was half a million less than the 1935-39 average. Skilled labor is being offered enticing opportunities in non-

farm work. Young people are leaving the farms to enter the military services.

Farmers have been buying more equipment to offset insofar as possible the exodus of workers from the farm and to make the chores more attractive for those who remain. Producers, too, with more money available, have invested more heavily in machinery. Development of tractors and other equipment suited to farm enterprises of varying sizes also has been responsible for an increase in purchases of such machinery.

Another factor is the continuous educational program on the part of vocational agriculture, the extension services, equipment companies, and the Land Grant Colleges, in which producers have been taught how to operate and care for machinery. With more farmers learning how to operate modern equipment, more is being bought.

Use of Machinery

Demand for farm machinery has been increasing to such an extent that it is expected to exceed supply in 1951. This situation has developed not only because farmers want machines but also because of the stepped-up output of war materials. Although manufacturing capacity is adequate, steel and other metals are being diverted to the mobilization effort. Production for the first quarter of the farm equipment industry's fiscal year is only 75 per cent of the output for the same period last year.

On July 1, 1950, there were 992,000 tractors on Cotton Belt farms as compared with 335,000 in 1940. During the same 10-year period there has been a 220-per-cent increase in the number of moldboard plows and a 65-per-cent increase in manure spreaders.

In 1940 there were only a few mechanical cotton harvesters on Cotton Belt farms. Today there are more than 4,000 spindle-type pickers and 9,000 stripper harvesters available, and by the harvest season of 1951 the total is expected to be increased to around 6,500 pickers and more than 13,000 strippers.

This machinery not only will be a boon to cotton farmers sorely beset by labor shortages in 1951, it will be one of the most important assets in the effort to produce 16 million bales of cotton. It will be important because cotton farmers are using these machines, achieving greater efficiency in their production.

Today tractors are used for 60 per cent of the land breaking for cotton, as compared with 30 per cent in 1939. In Oklahoma, Texas, and New Mexico tractors are used for breaking more than four-fifths of the cotton land, while in California and Arizona the total is nearly 97 per cent.

Across the Cotton Belt, tractors are used for 54 per cent of the harrowing, 43 per cent of the planting, and 45 per cent of the cultivation.

In 1940 only a very small percentage of the cotton acreage was harvested with machines. In 1950 it was estimated that equipment was available for harvesting 16 per cent of the crop. With the pickers and strippers expected to be on hand in 1951, it will be possible to harvest an estimated 4,800,000 acres as compared with 3,000,000 last year.

Cotton production in California, Arizona, Texas, Oklahoma, and the Mississippi River Delta is relatively highly mechanized from seedbed preparation through harvest. Although tractor equipment is rapidly replacing animal-drawn machines in the Southeast for land breaking, seedbed preparation, and cultivation, most of the crop still is harvested by hand.

A spindle-type cotton picker, the harvester used most successfully in the rank, leafy cotton of the Southeast, represents an investment of several thousand dollars. A large part of the cotton in the Southeast is grown on small farms where the cotton grower does not feel the cost of such a picker would be justified. The machine, too, is better adapted to large, level fields

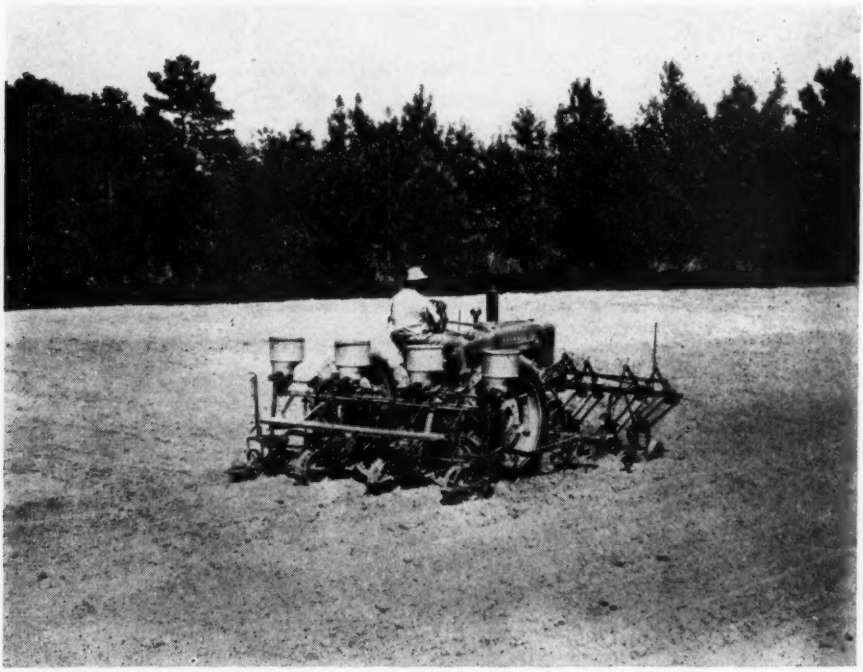
(*Turn to page* 41)

PICTORIAL

Picking cotton by hand is a slow and tedious job.

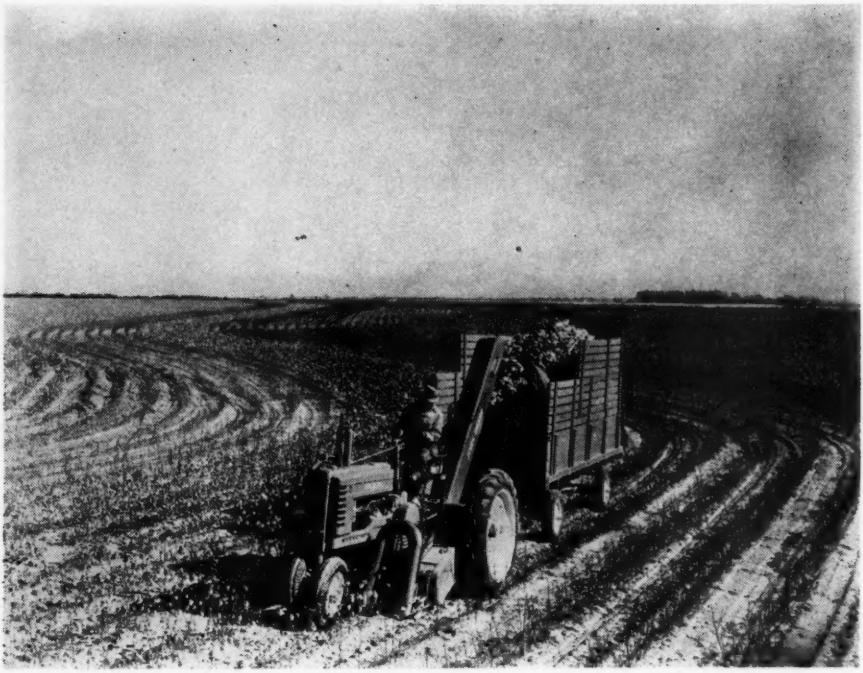
Above: **Four-row middle busters can cover as many as 30 acres per day in preparing land for planting cotton.**

Below: **This tractor-powered machine will plant from 50 to 60 acres per day and can be used as a power drill or corn planter.**



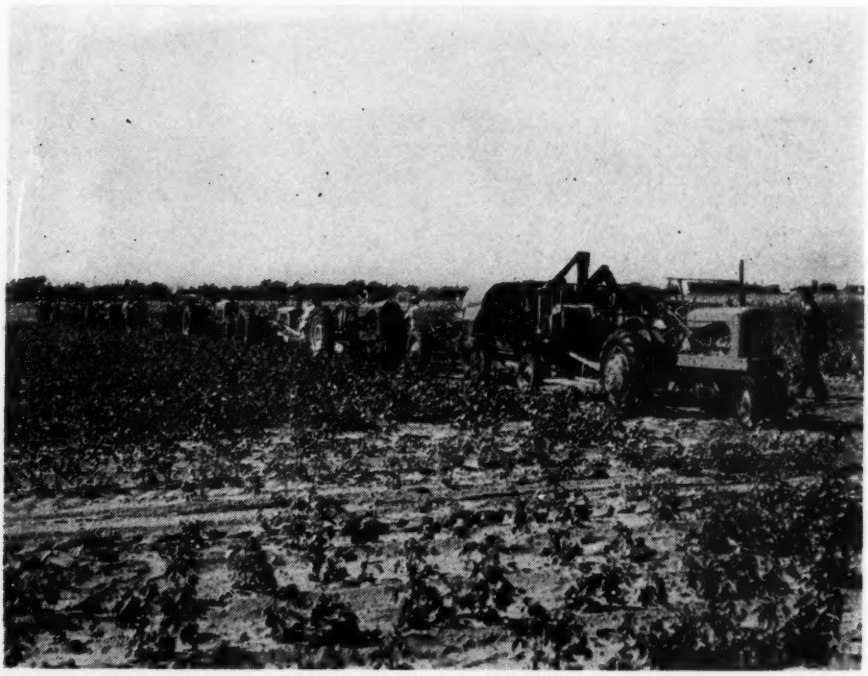
Above: **Searing jets of flame from this two-row flame cultivator kill weeds and grass but do not harm cotton.**

Below: **Tractor-mounted equipment can apply insecticides and defoliants to as many as 40 acres of cotton per day.**



Above: **The two-row stripper performs the same amount of work as 26 average hand strippers.**

Below: **Machines on parade at the annual Beltwide Cotton Mechanization Conference sponsored by the National Cotton Council.**



The Editors Talk

Mechanizing the Production of Cotton

With the current urgency and interest in meeting the goal of the production of 16 million bales of cotton this year, we are pleased to have two cotton articles to present to our readers in this issue. The one pertains to the role of fertilizers in increasing cotton production, whereas the other considers more particularly the other important factors. Among these factors, mechanization wherever possible is being emphasized. The good pictures obtained from the National Cotton Council and appearing in our pictorial section show much of the progress already made in this field.

That more progress is in store is assured as the results of the cooperative study being made by the U. S. Department of Agriculture and 12 Southern State Experiment Stations, in the Regional Cotton Mechanization project under the Research Marketing Act of 1946, are put into use. Current research embraces crop residue disposal, seedbed preparation, planting, grass and weed control, fertilization and cover crops, and harvesting. There also is work being done on insect control and cotton processing.

Some of the outstanding results already obtained are detailed in a recent publicity release by the U. S. Department of Agriculture. Work with deep-tillage equipment (moldboard plows and chisels) on some Alabama soils has resulted in improved weed and grass control, larger cotton yields, and deep-rooted cotton plants that better resist the pull of mechanical strippers. Mississippi planting studies have shown that mechanized operations are made easier and require less seed and hoeing if the cotton seeds are hill-dropped (planted in bunches rather than drilled) in leveled seedbeds. The machine developed to do this job quickly consists of a shallow-operating sweep-cultivator mounted in front of a tractor to clean out the weeds, and large runner wings on the rear-mounted planter to level the seedbeds after planting.

Chemical weed control to replace some early cultivation previously required in cotton production has been brought out in some recent research. Pre-emergence spray tests (applying spray before the cotton is above ground) in Georgia reduced hoeing as much as 40 per cent. Pre-emergence spraying controls weeds during the critical 4-6 weeks after planting. Because of cost, post-emergence weed spraying (spraying after the cotton is up) has not yet proved as practical as mechanical cultivation. However, the cost of hoe labor has been cut by as much as 55 per cent by post-emergence treatments. Widely used rotary weeders and sweep cultivators have been improved by Mississippi research so that they can be used behind high-speed, rubber-tired tractors. They give longer wear and better performance at no increase in cost.

Cotton fertilizer needs are being investigated in North Carolina with a machine developed to accurately place given amounts of radioactive granular fertilizers, which then can be scientifically traced as they are used by the plants.

Further research is going forward on the expanding use of anhydrous ammonia in Mississippi.

A modified grain drill has been successfully used in Georgia to seed cover crops in unharvested cotton. A brush-type cotton stripper, developed in Oklahoma, is showing promise of providing low-cost cotton harvesting, and tests of small, low-cost spindle-type harvesters in South Carolina this past season were encouraging.

All of this research is being counted upon to help in meeting this and future cotton goals on reduced acreages. That it will be employed wherever possible is guaranteed by the great eagerness with which Southern farmers are seeking and applying new and scientific production practices. The greatly increased diversification in Southern agriculture which has taken place during the past several years and from which so much benefit has been derived is further assurance our cotton needs can and will be met without re-employment of the acres which have been put into pastures and other crops that have been responsible for the terminology—"The New and Mechanized South."

Rising Farm Costs

Most farmers in planning their 1951 operations are deeply concerned over the inflationary spiral which is resulting in increased production costs. It is well, then, to reconsider the statement of Carl P. Heisig, Head, Division of Farm Management and Costs, Bureau of Agricultural Economics, at the Agricultural Outlook Conference held in Washington, D. C., last November. Granting that farm costs will be higher in 1951 than in 1950, Mr. Heisig believed that prices received will be up enough more so that in the over-all picture the net realized farm income should be considerably higher than last year. However, price-cost ratios will not be equally favorable for all types of farming and farmers may not be as prosperous as in the immediate postwar years.

Prices, of course, depend on supply and demand. In his outlook Mr. Heisig foresaw farmers probably being less concerned about prices of production goods and services in 1951 than about the availability of supplies. He believed that supplies of feed and most seed will be adequate, and fertilizer supplies larger, although demand could increase faster than supplies, particularly in some areas. Farm machinery and other equipment and supplies should be available well into 1951. The outlook for the last half of 1951 is less certain.

In more detailed reference to fertilizer, it was stated that the average price paid by farmers for fertilizer declined slightly in 1950 compared with 1949. In 1951 it probably will be higher, but prices received for farm products will increase at least as much. This continued favorable cost-price ratio will make it profitable for farmers to increase the use of fertilizers at a more rapid rate than they have during the last few years.

Farmers are now using about three times as much plant nutrients in fertilizer as they did in 1935-39. The use has increased at an average annual rate of about 10 per cent during recent years. With expected continued favorable price relationships, a similar or even greater increase can be expected for 1951 if supplies are available. Expansion of 10 per cent would mean a consumption of fertilizer in terms of plant nutrients of 4.6 million tons in 1951, compared with 4.2 million tons in 1950.

Mr. Heisig's concluding statement was that except for some temporary seasonal and local shortages, most production goods and services are expected to be adequate to meet farmers' needs for doing the larger production job of 1951. With a reasonable expectation of higher farm prices, there therefore should not be an unreasonable concern on the farmers' part about rising farm costs.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949.....	28.6	46.3	128.0	214.0	119.0	186.0	16.55	43.40	....
1950									
March.....	28.05	32.0	132.0	222.0	119.0	198.0	16.45	43.00	....
April.....	28.74	....	134.0	228.0	126.0	201.0	16.65	44.40	....
May.....	29.24	48.5	128.0	228.0	134.0	204.0	17.25	45.20	....
June.....	29.91	49.7	127.0	211.0	136.0	193.0	16.05	46.20	....
July.....	33.05	45.5	127.0	208.0	144.0	199.0	15.15	52.00	....
August.....	36.95	53.1	122.0	218.0	144.0	197.0	15.45	70.90	....
September...	39.98	55.4	105.0	192.0	144.0	194.0	15.55	78.80	....
October.....	38.90	55.1	85.8	154.0	137.0	191.0	15.85	81.50	....
November....	41.13	52.5	87.8	148.0	137.0	194.0	16.45	98.40	....
December....	40.36	47.2	88.9	173.0	145.0	203.0	17.05	102.00	....
1951									
January.....	41.31	45.9	98.6	194.0	154.0	209.0	17.85	101.00	....
February....	41.75	32.5	103.0	205.0	160.0	221.0	18.45	100.00	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	207
1946.....	263	382	178	248	212	209	141	319	182
1947.....	257	380	232	248	336	259	148	381	226
1948.....	245	482	222	253	201	226	155	298	214
1949.....	231	463	184	244	210	210	139	192	201
1950									
March.....	226	320	189	253	185	224	139	191	168
April.....	232	...	192	260	196	227	140	197	205
May.....	236	485	184	260	209	231	145	200	178
June.....	241	497	182	240	212	218	135	205	182
July.....	267	455	182	237	224	225	128	231	200
August.....	298	531	175	248	224	223	130	314	164
September...	322	554	151	219	224	219	131	349	126
October.....	314	551	123	175	213	216	134	361	138
November....	332	525	126	169	213	219	139	436	188
December....	325	472	128	197	226	230	144	452	211
1951									
January.....	333	459	141	221	240	236	150	448	324
February....	337	325	148	233	249	250	155	443	333

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per Unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per Unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950						
March	3.00	2.32	9.70	13.01	10.17	9.34
April	3.00	2.32	10.34	12.58	10.39	8.19
May	3.00	2.05	10.74	11.97	10.14	7.59
June	3.00	1.71	10.55	10.79	9.41	7.36
July	3.00	1.71	11.53	10.71	9.35	8.74
August	3.00	1.71	11.44	11.06	10.62	9.87
September	3.00	1.71	11.44	10.85	10.85	10.32
October	3.00	1.71	11.86	10.63	10.62	10.32
November	3.00	1.68	11.96	10.63	10.85	10.62
December	3.00	1.88	13.48	10.95	10.93	10.93
1951						
January	3.10	1.88	13.37	11.30	11.29	11.11
February	3.13	1.88	13.58	11.39	11.53	11.30
Index Numbers (1910-14 = 100)						
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950						
March	112	81	277	369	302	265
April	112	81	295	356	308	233
May	112	72	307	339	301	216
June	112	60	301	306	279	209
July	112	60	329	303	277	248
August	112	60	327	313	315	280
September	112	60	327	307	322	293
October	112	60	339	301	315	293
November	112	59	342	301	322	302
December	112	66	385	310	324	311
1951						
January	116	66	382	320	335	316
February	117	66	388	323	342	321

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[1]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950							
March	.760	3.76	5.47	.375	.720	14.50	.200
April	.760	3.76	5.47	.375	.720	14.50	.200
May	.760	3.76	5.47	.375	.720	14.50	.200
June	.760	3.76	5.47	.336	.647	12.77	.176
July	.760	3.76	5.47	.368	.704	13.98	.193
August	.760	3.76	5.47	.368	.704	13.98	.193
September	.760	3.75	5.47	.368	.704	13.98	.193
October	.760	3.73	5.47	.386	.704	13.98	.193
November	.760	3.73	5.47	.386	.732	14.72	.193
December	.798	3.73	5.47	.420	.796	16.00	.210
1951							
January	.810	3.73	5.47	.420	.796	16.00	.210
February	.810	3.73	5.47	.420	.796	16.00	.210
Index Numbers (1910-14 = 100)							
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950							
March	142	104	112	68	76	60	83
April	142	104	112	68	76	60	83
May	142	104	112	68	76	60	83
June	142	104	112	63	68	53	80
July	142	104	112	67	74	58	82
August	142	104	112	67	74	58	82
September	142	104	112	67	74	58	82
October	142	103	112	70	74	58	82
November	142	103	112	70	77	61	82
December	149	103	112	75	84	66	85
1951							
January	151	103	112	75	84	66	85
February	151	103	112	75	84	66	85

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1925.....	156	153	151	112	100	131	109	80
1926.....	146	150	146	119	94	135	112	86
1927.....	141	148	139	116	89	150	100	94
1928.....	149	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	123	130	127	86	56	130	102	77
1942.....	158	149	144	93	57	161	112	77
1943.....	192	165	151	94	57	160	117	77
1944.....	196	174	152	96	57	174	120	76
1945.....	206	180	154	97	57	175	121	76
1946.....	234	197	177	107	62	240	125	75
1947.....	275	231	222	130	74	362	139	72
1948.....	285	250	241	134	89	314	143	70
1949.....	249	240	226	137	99	319	144	70
1950								
March....	237	239	223	134	96	305	142	72
April.....	241	240	223	135	96	313	142	72
May.....	247	244	228	132	91	311	142	72
June.....	247	245	230	126	85	293	142	66
July.....	263	247	238	128	85	301	142	70
August....	267	248	243	131	85	321	142	70
September.	272	252	247	131	85	324	142	70
October...	268	253	247	131	85	323	142	73
November.	276	255	251	132	85	328	142	74
December..	286	257	256	138	88	346	149	78
1951								
January...	300	262	261	140	90	351	151	78
February..	313	267	268	141	91	358	151	78

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Behavior of Nitrogenous Fertilizers in Alkaline Calcareous Soils: II. Field Experiments with Organic and Inorganic Nitrogenous Compounds," Agr. Exp. Sta., Univ. of Ariz., Tech. Bul. 121, Dec. 1950, W. H. Fuller, W. P. Martin, and W. T. McGeorge.

"Utilization of Phosphorus by Various Crops as Affected by Source of Material and Placement," Agr. Exp. Sta., Colo. A & M College, Fort Collins, Colo., Tech. Bul. 42, Dec. 1950, S. R. Olsen, W. R. Schmehl, F. S. Watanabe, C. O. Scott, W. H. Fuller, J. V. Jordan, and R. Kunkel.

"Recommended Fertilizer Practices for Field Crops in Colorado for 1951," Agr. Exp. Sta., Fort Collins, Colo.

"Fertilizer Recommendations for Idaho Soils for 1951," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, G. O. Baker, C. A. Simkins, A. S. Horn, and V. T. Smith.

"How and When to Use Chemical Fertilizers in Kansas," Kan. State College, Manhattan, Kan., F. W. Smith.

"Fertilizer Analyses—Fall 1950," Kan. State Board of Agr., Control Div., Topeka, Kan.

"Fertilizer Recommendations of the Louisiana Agricultural Experiment Station, 1950-51," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., M. B. Sturgis.

"Use of Fertilizer for Maine Blueberries," Agr. Exp. Sta., Orono, Me., Mimeo. Rpt. No. 8, Feb. 1950, M. F. Trevett.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Univ. of Mass., Amherst, Mass., Bul. No. 145, July 1950.

"Fertilizer Analysis and Registrations 1950," Dept. of Agr., Div. of Feed and Fert. Control, St. Paul, Minn. H. A. Halvorson.

"Crop and Fertilizer Recommendations for Mississippi 1951," Agr. Exp. Sta., Miss. State College, State College, Miss., Cir. 156, Nov. 1950, F. J. Welch.

"Fertilizer Inspection and Analysis; Fall, 1949," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 543, Nov. 1950.

"Commercial Fertilizer Report for 1950," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 473, Dec. 1950.

"Commercial Fertilizers for Oats in Nebraska, Results for 1947, 1949, and 1950," Agr. Exp. Sta., Univ. of Neb., Lincoln, Neb., Outstate Testing Cir. 13, Dec. 1950, G. W. Lowrey, R. A. Olson, and A. F. Dreier.

"Fertilizer Recommendations for New Hampshire," Ext. Serv., Univ. of N. H., Durham, N. H.

"Sodium as a Fertilizer for New Jersey Soils," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Bul. 752, Oct. 1950, C. D. Leonard and F. E. Bear.

"Fertilizers and Limes—1950," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Insp. Series 41, Dec. 1950, S. B. Randle.

"Facts and Findings about Fertilizers in North Dakota," Ext. Serv., N. D. Agr. College, Fargo, N. D., Dec. 1950, G. A. Johnsgard.

"Rotation Fertilization," Ext. Serv., Pa. State College, State College, Pa., Jan. 1951.

"Fertilizer Grades and Rates of Application—Rhode Island—1951," Ext. Service, R. I. State College, Kingston, R. I.

"Inspection and Analysis of Commercial Fertilizers," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 389, Nov. 1950, B. D. Cloaninger.

"Oat Fertilizer Tests in North-Central Texas," Agr. Exp. Sta., Texas A & M College, College Station, Tex., P. R. 1287, Nov. 6, 1950, J. H. Gardenhire, M. J. Norris, J. C. Smith, and D. I. Dudley.

"1951 Vermont Recommendations for Seed, Fertilizer, and Lime," Agronomy Dept., Univ. of Vt., Burlington, Vt.

"Virginia Agricultural Lime Law 1950," Dept. of Agr. and Immigration, Richmond, Va.

"The Fertilizer Situation for 1950-51," Prod. and Mkt. Adm., USDA, Wash., D. C., Feb. 1951.

Soils

"Soil Treatment Recommendations Based on Soil Tests," Ext. Serv., Univ. of Ill., Urbana, Ill., C. M. Linsley.

"Muck Soil Management for Head Lettuce Production," Ext. Bul. 303; "Muck Soil Management for Hay and Pasture Production,"

Ext. Bul. 304; Ext. Serv., Mich. State College, East Lansing, Mich., P. M. Harmer.

"Soil Diagnosis and Fertilizer Recommendations for Crops on Western Oregon Soils," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., R. E. Stephenson.

Crops

"Value of Irrigation with Different Fertility Treatments for Vegetable Crops," Bul. 276, June 1950, L. M. Ware and W. A. Johnson; "Experiments with Oil Crops," Bul. 277, Sept. 1950, D. G. Sturkie; Agr. Exp. Sta., Ala. Poly. Inst., Auburn, Ala.

"Small Grain Variety Tests in Alabama, 1950," Agr. Exp. Sta., Ala. Poly. Inst., Auburn, Ala., P. R. Series No. 11, Rev. Aug. 1950, E. F. Schultz, Jr.

"Cucamonga Brome—A New Grass for Covercropping," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 401, Nov. 1950, P. E. Lemmon, A. L. Hafenrichter, and B. A. Madson.

"Production, Harvesting and Curing of Burley Tobacco," Dom. Exp. Sta., Harrow, Ont., Can., Pub. 840, Farm. Bul. 163, Aug. 1950, R. J. Haslam and W. A. Scott.

"Annual Report 1949-1950," State Board of Agr., Dover, Del., Vol. 40, No. 3.

"Southland Oats—A New Variety," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Cir. S-18, Sept. 1950, W. H. Chapman.

"Winter Cover Crops for Nitrogen, Organic Matter, and Soil and Plant Food Conservation," Cir. 300, Rev. Sept. 1950; "Kudzu Culture and Uses in Georgia," Cir. 331, Rev. June 1950, E. D. Alexander, J. B. Preston, and J. R. Johnson; Ext. Serv., Univ. of Ga., Athens, Ga.

"Growing and Marketing Georgia Sweet Potatoes," Bul. 482, Rev. April 1950, W. C. Carter; "Plant Beds for Early Plants," Bul. 560, June 1950, W. C. Carter and E. Ragsdale; Ext. Serv., Univ. of Ga., Athens, Ga.

"Vegetative Propagation of Trees and Shrubs," Ext. Cir. No. 291, Aug. 1950, A. M. Hieronymus; "Cucumber Culture in Hawaii," Ext. Cir. No. 290, Aug. 1950, Y. Nakagawa; Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii.

"Soybean Yields in 1949 Variety Trials," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Cir. 669, Nov. 1950, R. F. Fuelleman, W. L. Burlison, C. H. Farnham, G. E. McKibben, and P. E. Johnson.

"Bromegrass in Indiana," Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Leaf. 310.

"Cooperative Oat Variety Tests, 1949," P. R. Series C.E. No. 20; "Cooperative Wheat Fertility Tests, 1950," P. R. Series C.E. No. 24; "Cooperative Oat Variety Tests, 1950," P. R. Series C.E. No. 25, A. L. Clapp, Agr. Exp. Sta., Kans. State College, Manhattan, Kans.

"Tobacco Production in Kentucky," Cir. 482, "It Pays to Prime and Cut Burley Tobacco Ripe," Cir. 483, G. B. Byers, C. E. Bortner, and W. B. Back; Ext. Serv., Univ. of Ky., Lexington, Ky.

"A Preliminary Report of Tests Conducted by the Red River Valley Agricultural Experiment Station, 1948-1949;" "A Preliminary Report on Experiments Conducted by the Crops and Soils Department of the Louisiana Agricultural Experiment Station, 1949;" "A Preliminary Report of Tests Conducted by the Red River Valley Agricultural Experiment Station, 1950," Agr. Exp. Sta., La. State Univ., Baton Rouge, La.

"Agricultural Research in Maine Sixty-sixth Annual Report of Progress, Year Ending June 30, 1950," Agr. Exp. Sta., Univ. of Me., Orono, Me., Bul. 483, June 1950.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1949," Agr. Exp. Sta., Univ. of Nev., Reno, Nev.

"Tomatoes for New Hampshire," Ext. Serv., Univ. of N. H., Durham, N. H., Ext. Cir. 299, June 1950, J. R. Hepler, E. E. Ellis, M. C. Richards, and J. G. Conklin.

"Poultry Ranges," Cir. 536, Apr. 1950; "Blueberries in the Garden," Cir. 538, Sept. 1950, C. A. Doehlert; Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J.

"A Guide to Forest Tree Planting in New Jersey," Ext. Serv., Rutgers Univ., New Brunswick, N J., Leaf. 43, July 1950, A. N. Lentz.

"Sixty-second Annual Report," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., 1949.

"Responses of McIntosh Apple Orchards to Varying Nitrogen Fertilization and Weather," Memoir 290, Aug. 1950, D. Boynton, A. B. Burrell, R. M. Smock, O. C. Compton, J. C. Cain, and J. H. Beattie; "Stimulated Grazing Treatments Effect on Yield, Botanical Composition, and Chemical Composition of a Permanent Pasture," Memoir 295, Aug. 1950, W. K. Kennedy; Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y.

"Carolina Lawns," Ext. Serv., N. C. State College, Raleigh, N. C., Rev. Ext. Cir. 292, Aug. 1950, J. Harris and D. S. Chamblee.

"1950 Hybrid Corn Field Trials," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Agron. Mimeo. Cir. 83, Jan. 1951, W. Wiidakas, L. W. Briggle, and R. B. Widdifield.

"Science Serving Agriculture, Part I. Report of Research," "Science Serving Agriculture, Part II. Staff, Publications, and Financial Statement," Biennial Rpt. 1948-1950, Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Dec. 1950.

"Oregon's Agricultural Progress Through Research," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 491, Nov. 1950, S. H. Bailey and N. R. Gish.

"Rapid, Low-Cost Conversion From Rice to Improved Pastures," Bul. 729, Oct. 1950, J. B. Moncrief and R. M. Weihing; "Hairy Vetch, Bur Clover and Oats as Soil-Building Crops for Cotton and Corn in Texas," Bul. 731, Dec. 1950, E. B. Reynolds, P. R. John-

son, and H. F. Morris; Agr. Exp. Sta., Tex. A & M College, College Station, Tex.

"Biennial Report 1948-50," Agr. Exp. Sta., Utah State College, Logan, Utah, Bul. 343.

"Recommendations for Range Reseeding in Utah," Ext. Serv., Utah State College, Logan, Utah, Ext. Bul. 212.

"Progress Through Your College of Agriculture," Univ. of Vt., Burlington, Vt., Rpt. 4, Dec. 1950.

"Results of Hybrid Corn Yield Trials in West Virginia, 1950," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., M Cir. 66, Feb. 1951, J. L. Cartledge, R. J. Friant, and C. W. Neal.

"What's New in Farm Science, Annual Report, Part I," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 491, Sept. 1950.

"Agricultural Extension in Wisconsin Report for 1949," Cir. 388, July 1950; "Bromegrass & Alfalfa for Hay Pasture or Silage," Cir. 344, Rev. June 1950, H. L. Ahlgren and F. V. Burcalow; Ext. Serv., Univ. of Wis., Madison, Wis.

"How About Grass Silage? Making It—Feeding It," Ext. Serv., Univ. of Wis., Madison, Wis., Sten. Cir. 277, Rev. Aug. 1950, N. N. Allen, G. Bohstedt, and F. W. Duffee.

"Tobacco Diseases and Their Control," Farmers' Bul. No. 2023, USDA, Wash., D. C.

"Stubble-Mulch Farming on Wheatlands of the Southern High Plains," Cir. No. 860, Aug. 1950, W. C. Johnson; "Sericea and Other Perennial Lespedezas for Forage and Soil Conservation," Cir. 863, Nov. 1950; USDA, Wash., D. C.

Economics

"Cigar Leaf Marketing Studies, 1. Market Reporting for Connecticut Valley Binder Tobacco," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Bul. 265, Nov. 1950, A. W. Dewey and A. J. Coutu.

"Cigar Leaf Summer Statistics," Inf-18, Aug. 1950, A. W. Dewey; "Experimental Market Reporting for Connecticut Valley Binder Tobacco Markets to December 26, 1950," Inf-21, Jan. 1951, A. W. Dewey and A. J. Coutu; Agr. Exp. Sta., Univ. of Conn., Storrs, Conn.

"Tobacco, Production Practices and Costs, Lower Coastal Plain, Georgia," Mimeo. Series 17, Mar. 1950, B. J. Harrington; "Cotton Production Practices and Costs Limestone Valley, Georgia," Mimeo. Series 19, Mar. 1950, W. T. Fullilove and J. C. Elrod; "Wheat Production Practices and Costs, Piedmont, Georgia," Mimeo. Series 20, Mar. 1950, B. J. Harrington; "Marketing Okra and Other Vegetables, Grady County, Georgia, 1949," Mimeo. Series 21, May 1950, K. E. Ford and N. M. Penny; "Cotton Production Practices and Cost in the Piedmont Area of Georgia," Mimeo. Series 25, Aug. 1950, R. B. Glasgow and W. T. Fullilove; "Cotton Production Practices and Cost in the Upper Coastal Plain of Georgia," Mimeo. Series 32, Oct. 1950, W. T. Fullilove and J. C. Elrod; Agr. Exp. Sta., Univ. of Ga., Experiment, Ga.

"Twenty Years of Prices and Incomes Received by Illinois Farmers 1929-1948," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Bul. 542, Sept. 1950, G. L. Jordan.

"Farm Planning in Indiana," Ext. Serv., Purdue Univ., Lafayette, Ind., Ext. Bul. 355.

"Missouri Needs More Livestock Pasture Farming," Ext. Serv., Univ. of Mo., Columbia, Mo., Folder 9, Aug. 1950.

"1950 Income-tax Returns Suggestions for Farmers," Ext. Serv., Cornell Univ., Ithaca, N. Y., Ext. Bul. 809, Nov. 1950, V. B. Hart and M. S. Kendrick.

"Desirable Production Adjustments in Ohio Agriculture in 1951 (Under assumed conditions)," Agr. Exp. Sta., Ohio State Univ., Columbus, Ohio, Mimeo Bul. 219, Oct. 1950.

"Oregon's Small Fruit Crops 1936-1949," Ext. Serv., Oreg. State College, Corvallis, Oreg., Ext. Bul. 710, Aug. 1950.

"The 1951 Handbook of Conservation Practices for: 1061, Fla.; 1061, Hawaii; 1061, Ky.; 1061, Mich.; 1061, N. Y.; 1061, Okla.; 1061, Utah; 1061, Wyo.; Pro. and Mkt. Adm., USDA, Wash., D. C.

"Report of the Chief of the Bureau of Agricultural and Industrial Chemistry Agricultural Research Administration 1950," USDA, Wash., D. C.

"Annual Report of the Farm Credit Administration, 1949-50," USDA, Wash., D. C.

"Report of the Manager of the Federal Crop Insurance Corporation, 1950," USDA, Wash., D. C.

"Report of the Solicitor to the Secretary of Agriculture for the Fiscal Year Ended June 30, 1950," USDA, Wash., D. C.

"Report of the Administrator of the Commodity Exchange Authority 1950," USDA, Wash., D. C.

"Report of the President of the Commodity Credit Corporation 1950," USDA, Wash., D. C.

"Sizes of Farms in the United States," USDA, Wash., D. C., Tech. Bul. No. 1019, July, 1950, K. L. Bachman and R. W. Jones.

"Loans and Discounts of Lending Institutions Supervised by Farm Credit Administration," Semiannual Rpt. Dec. 1950, USDA, Wash., D. C.

"Conservation and Use of Agricultural Land Resources," Pro. and Mkt. Adm., USDA, Wash., D. C., Jan. 1951.

"1951 Special Agricultural Conservation Program for Puerto Rico," Pro. and Mkt. Adm., USDA, Wash., D. C., Nov. 1950.

"World Food Situation 1951," USDA, Wash., D. C., WFP-1-51, Feb. 1951.

"Some Landmarks in the History of the Department of Agriculture," USDA, Wash., D. C., Agr. History Series No. 2, Rev. Jan. 1951.

Hybrid Cotton Coming: But Probably Not Soon

INGENUITY, amounting to scientific trickery, is the hope of geneticists bent on putting hybrid vigor (hoterosis) into the cotton crop. Unlike corn—world's leading example of hybrid advantage among economic plants—cotton and most other crops have complete flowers. Corn has its male and female flowers widely separated and the pollen-bearing tassels are handy for removal. As a result, hybrid seed can be produced in quantity and economically.

According to geneticists Harold D. Leden of the University of Georgia and T. R. Richmond of the U. S. Department of Agriculture, there is evidence of significant increases in vigor, yield, and other characters in cotton as a result of various kinds of crosses in commercial varieties of four species. Those scientists are optimistic that some day hybrid vigor will give to the cotton grower somewhat the same sort of help it is now giving to the corn farmer. They say that large scale commercial utilization of natural crossing to produce hybrid cottonseed is not to be expected in the immediate future. However, some male-sterile plants have been found, opening the possibility for field crossing on a natural basis as worked out recently with onions.

When hybrid vigor can be captured, it builds up yields at a lower cost than almost any other factor, so both plant breeders and planters are determined to clear away difficulties and have this now familiar magic in the cotton fields.

Nature Tests the Seed

THE certified seed program sees to it that Nature is kept on the job in making climatic selections of hardy alfalfa. This is true even when the seed of the selected hardy alfalfa varieties are grown in the warm Southwest and are returned to the northern areas for field planting. There is a safety-first rule. The grower of certified seed can sell only from the first generation crop that grows from seed of northern origin and selection. Thus, says Dr. M. A. McCall of the U. S. Department of Agriculture, an Arizona grower of certified seed who wants to market his crop as suitable for planting in Montana, the Dakotas or in the East, must buy the seed he, himself, plants from an approved northern source. The rules do not permit him to plant even a second generation of his own seed, because the less rigorous climate and disease hazard might foster multiplication of the less hardy kinds of plants in the variety. But in a single generation there is little loss of hardiness.

Scientists, thus, have found the way to take a double advantage of Nature. For developing varieties resistant to cold or disease hazards, the plant breeder makes his selections where Nature imposes the most severe conditions. Then after Nature has aided in selection of a valuable variety, seed can be grown where Nature and man provide conditions most favorable for efficient seed production. This is in the hot and dry Southwest where rainfall during harvest is not a serious drawback and where moisture for growing can be supplied by irrigation.

Such superior varieties as Ranger, Buffalo, and Atlantic alfalfas have qualities of hardiness (resistance to cold and drought), and disease resistance, that have been developed by breeding and by generations of selection in fields where freezing and the disease organisms kill off individual plants

that are not resistant. Seed from such plants transmit these good qualities. Such seed can be grown safely only for a single generation in the specialized seed-growing areas of the Southwest. But if successive generations were permitted, less hardy and less resistant variants might multiply unduly and Southwestern seed might again come to be regarded as unreliable for northern planting. Such protection is one of the features of the National Foundation Seed Project, says McCall.

Meeting the Cotton Goal

(*From page* 26)

than to small, hilly, or rolling plots which comprise a sizable part of the the cotton acreage in the Southeast. The stripper is a less expensive machine but the root system of the type cotton grown in the Southeast does not penetrate to a sufficient depth to hold the plant in the ground while cotton is being stripped from the plant.

Research to develop more versatile cotton production machinery is being pushed ahead aggresively by both government and industry. It is being spurred by an increasing demand on the part of cotton farmers who are not satisfied with a system in which more than half the production cost can be attributed to hand labor. It is being encouraged through necessity as farmers observe the drift of workers from the land. It is moving ahead as cotton farmers step in pace with a world where emphasis is constantly given to the fact that savings in labor and costs of production mean greater profits and a higher standard of living.

Cotton growers are moving to mechanization as they note the convincing achievements of experiment stations in effecting vast savings in man-hours through the use of fast-moving equipment to prepare the land, and through the employment of rotary hoes, flame cultivators, mechanical choppers, and pickers and strippers which can harvest more cotton in a day than the average hand laborer can gather in a month. They are encouraged by the progress of research in chemical weed control, which holds out the possibility that this last great barrier to full mechanization may soon be broken. They have seen that through mechanization the number of man-hours required to produce a bale of cotton can be reduced by more than three-fourths.

In the Coastal Plains of North Carolina, for example, these hours have been slashed from almost 146 to approximately 25. With yields of 423 pounds to the acre, under the old man-mule system, 15.3 hours were required for land preparation and planting, 33.6 for cultivation and hoeing and 97 for picking. When tractors, two-row mechanical choppers, flame cultivators, mechanical pickers, and other machines were substituted to do these jobs, only four hours were required for land preparation and planting, 15.3 hours for cultivating and hoeing, and 5.9 for harvesting.

On land producing 500 pounds of lint per acre in the Mississippi Delta, labor requirements were slashed from almost 140 man-hours to less than 32 hours when two-row tractor equipment, flame cultivators, and spindle-type cotton pickers replaced one-row mule farming and hand picking.

In California, researchers found that with a yield of 750 pounds of lint per acre, only 25.4 hours were required to produce a bale of cotton when four-row tractor equipment and mechanical pickers were used. This compares with 107.4 hours when mule equipment and hand picking were employed.

On the High Plains of Texas, fast-moving machines have greatly reduced labor requirements. In this area, with yields of 182 pounds of lint per acre, 66 hours of labor were required under old methods as compared with 15.4 hours with four-row equipment and machine strippers.

These savings through mechanization and their recognition by farmers are indeed encouraging as the cotton industry moves ahead toward its goal of 16 million bales in 1951. Fully as stimulating, however, are the results of research in the allied phases of cotton production—fertilization, insect control, seed treatment, chemical weed control, and defoliation. This knowledge, more and more, is being translated into action on Cotton Belt farms, resulting in spectacular increases in yield and quality of cotton.

Machines can prepare the land in less hours, but good stands come from good seed properly treated to withstand disease. Fertilization supplies the plant with food needed for higher yields. Protection of the crop comes through insect and weed control. Finally, quality is protected through defoliation and proper harvesting and handling of seed cotton.

With exception of harvesting, machinery and labor requirements for producing 500 pounds of lint per acre vary little from those for producing 300 pounds. Common sense dictates, then, that cotton farmers should strive to apply amounts of fertilizer and insecticide recommended to enable them to produce as much as possible on each acre they plant.

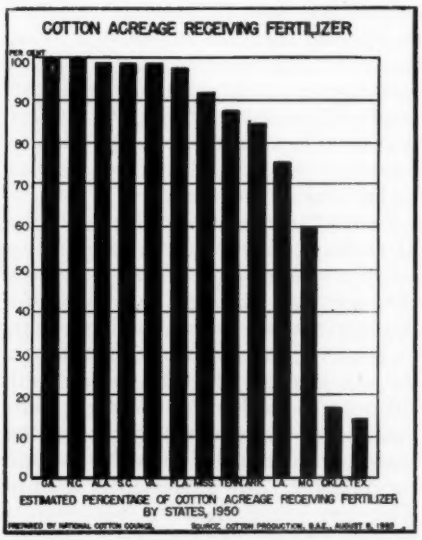
In many sections of the Cotton Belt, fertilizer is the key which opens the door to higher yields. Those farmers who doubt that the expenditure for these needed nutrients is justified, might well take a look at the results of experiments across the Cotton Belt. They prove conclusively that such an investment pays off handsomely—that more cotton and greater profits are the farmer's reward when he fertilizes as recommended.

At the South Carolina Experiment Station when 800 pounds of 4-8-4 fertilizer were applied, yields of lint cotton were increased an average of 177 pounds per acre, with a resultant increase of $49.43 per acre in net profits. In the Mississippi Delta net profits were hiked to $53.15 per acre when 250 pounds of nitrate of soda were used.

When fertilizer was applied in tests on different soil types during a four-year period in Texas, an average increase in yield of 175 pounds of seed cotton per acre was indicated.

The added expense of fertilization avails the farmer little, however, if insects destroy a substantial part of the crop before it reaches maturity. A thorough program of insect control, therefore, not only is necessary to protect his investment in fertilizer, but also to insure that his seed, labor, and time will not have been wasted.

Preliminary, unofficial estimates by the National Cotton Council indicate that cotton insect damage in 1950 amounted to nearly 600 million dollars. Although many cotton producers experienced a complete failure because of insect destruction, others who followed



recommended pest control programs made more cotton than ever before. In Mississippi, it is estimated that farmers saved more than a hundred million dollars through proper use of insecticides.

Insect control studies at College Station, Texas, indicated that 6 to 12 applications of insecticides as recommended resulted in yield increases ranging from 557 to 1,233 pounds of seed cotton per acre, and gains in net profits ranging from $88 to $133.

Defoliation, the use of chemicals to rid the plant of leaves, is associated closely with mechanization, fertilization, and insect and disease control. Where cotton is harvested mechanically, defoliation is almost a necessity since the chemicals remove the leaves, making the crop easier to harvest. Leaf stain and dry leaf trash are reduced, resulting in grade improvement and consequent better prices for the farmer's cotton in the market.

Where heavy applications of fertilizer are used, foliage of the plant is more dense and lower bolls sometimes rot. Defoliation, by ridding the plant of leaves, exposes more bolls to sunlight and air, thus reducing rot and allowing more bolls to mature. The exposed bolls open more rapidly and uniformly and a higher percentage of the cotton can be gathered at the first picking before it is greatly damaged by weather.

Defoliation is helpful in insect control late in the season. In many cases boll-weevils leave defoliated fields. In other instances defoliation may prevent late cotton leafworm infestation and heavy aphid population.

A combination of all these good cotton production practices—mechanization, fertilization, insect and disease control, control of weeds and grass, defoliation, and careful harvesting—will bring greater yields to farmers in 1951. Producers today, realize their value more than ever before. This knowledge, plus determination and hard work, will result in the attainment of their goal—production of the fiber and cottonseed this nation needs.

Increasing Cotton Yields in North Carolina

(*From page* 14)

start off slowly, and it has been observed that the seedling plants are less resistant to certain diseases. The soil reaction should be maintained at pH 6.0 to 6.5. The amount of lime needed varies depending upon the initial pH and the amount of clay and organic matter. The most satisfactory way to determine the amount of lime needed is to get a soil test. Where lime is needed, it should be applied and disked into the soil at least two months before planting.

Spacing

Much work has been done to determine the best plant spacing for cotton. The general practice is to plant a large number of seeds and then chop out the extra plants to the desired stand. However, many times good stands are ruined by improper chopping. It is necessary to have a sufficient number of plants present to utilize and return good profits from heavy fertilization and other approved practices.

Experiments conducted under conditions of adequate fertilization and good insect control practices show that three plants per foot of row (rows 3 to 3½ feet apart) gave the best yields (Figure 5). Plants spaced one foot apart may give larger plants and more bolls per plant but the final per-acre yield will be lower. A spacing of three plants per foot results in plants with

less branching. In these studies, the desired stand was obtained by hand thinning after uniform drilling.

The use of a good quality treated seed, good planting methods, band placement of fertilizer at planting, and care in chopping are all factors that must be considered in establishing uniform stands. In some areas, chopping is being eliminated by hill-dropping only enough seed to provide a good stand.

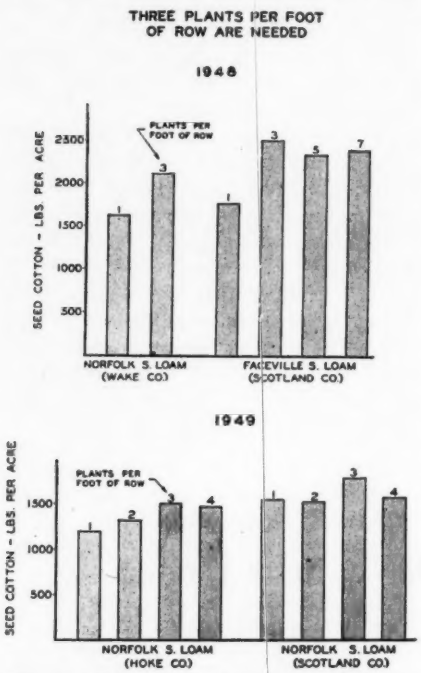


Fig. 5. Leave three plants per foot of row. Highest seed cotton yields were obtained from this spacing. These experiments were limed and fertilized at recommended rates and a good insect control program was followed.

Summary

Adequate quantities of nitrogen, phosphorus, potash, and lime must be supplied if high cotton yields are to be obtained. On average cotton soils in North Carolina, from 40-80 pounds of nitrogen per acre are needed to produce 1½ to 2 bales. Nitrogen applications should be reduced on dark soils. Following a good growth of a leguminous cover crop, cotton may require little if any nitrogen fertilizer. The response to nitrogen is complicated by insect injury and a good system of insect control is necessary in order to obtain greater returns from high fertilization. An early set of bolls is essential in obtaining profitable returns from the fertilizer, and early insect control is important.

From 50 to 100 pounds of P_2O_5 per acre and from 30 to 80 pounds of K_2O per acre are needed, the amounts needed depending upon the levels of these nutrients in the soil.

The soil reaction should be maintained at pH 6.0 to 6.5 by suitable applications of dolomitic limestone. Soil tests are helpful in determining the proper amounts of lime and fertilizer to apply.

Good stands are also important in obtaining high cotton yields. Under most North Carolina conditions, thinning to three plants per foot of row will give best results.

Fertilizing the Corn Crop in Wisconsin

(*From page* 10)

soil, but in general on these low-fertility fields this grade of fertilizer fits pretty well.

Summary

In summary then I'd say that the stepping-up of population to 12,000 or 16,000 stalks per acre is a prerequisite in the following program of fertilization for maximum yields of corn.

On a long-time soil fertility program we recommend the raising of the general level of fertility through liberal applications of phosphate, potash, and

Fig. 6. Liberal application of phosphate-potash fertilizer in the rotation is necessary in any long-time program of corn growing in Wisconsin. Abundant crops of clover or other legumes enrich the soil in nitrogen and organic matter. Manure applied on good legume sod plus "starter" fertilizer will supply an abundance of plant-food nutrients, and in normal seasons make possible the production of 100-bushel crops of corn in southern Wisconsin.

lime. This should pay off in the growing of abundant crops of clover and alfalfa. Where all crops grown are fed to livestock and the manure carefully handled and applied to the corn crop and where a good legume sod or better yet a second crop of clover or alfalfa is plowed down for corn, "starter" fertilizer (3-12-12, 4-16-8, or 4-20-10) applied with attachment on cornplanter is all that is needed to bring yields up to the 100-bushel mark.

On fields where corn follows corn or grain and where no manure is available, the sidedressing of corn with nitrogen fertilizer at the time of the second or third cultivation is strongly recommended (hill or drill application of 4-16-8, 3-12-12, or 5-20-20 with planter attachment should be increased up to 200 or 300 lbs. per acre). When corn is knee-high the application as a sidedressing of from 125 to 175 lbs. per acre of ammonium nitrate or its equivalent in the form of other nitrogen fertilizer such as ammonium sulphate, cyanamid, nitrate of soda, or urea will frequently increase yields from 15 to even 25 bushels per acre.

As a short cut to good yields on fields where little or no manure or commercial fertilizer has been applied in recent years and where the general level of fertility is low, we recommend a liberal application of a balanced fertilizer such as 10-10-10 or 8-8-8 (from 800 to 1,000 lbs. per acre). The fertilizer should be applied broadcast and plowed under or applied in bands with an attachment on the plow or by other devices that will place the fertilizer at a depth of from 6″ to 8″. "Starter" fertilizer is recommended in addition to the broadcast plow-under 10-10-10 treatment.

Yields of corn in Wisconsin can be doubled and trebled if farmers will follow practices which have been suggested here. Let's grow more bushels of corn per acre on fewer acres. Let's seed down and maintain good stands of grasses and legumes on our more erodible land. If we follow this program we will conserve our soil, increase its organic matter content, and thus preserve its fertility.

Clinics for Sick Soil

(*From page* 24)

tant factor since early cotton is the goal of every farmer situated in the northern part of the Cotton Belt where the growing season is comparatively short.

The many laboratories which dot the State are indeed helping the farmer to help himself, and thereby increasing his income.

A Look at Alfalfa Production In the Northeast

(*From page* 22)

a serious pest in parts of the Northeast, seems to be an exception since it grows as a winter annual when alfalfa is dormant. Di-nitro sprays offer promise of control if the chickweed is not matted too thickly. Applications of 20 pounds of sodium chlorate per acre offer some hope but further research work is needed in order to find an effective chemical to control chickweed and not harm alfalfa under all conditions.

Winterkilling due to a lack of winter-hardiness sometimes occurs, but if alfalfa varieties which have proven adapted to the conditions under which they are to be utilized are grown, this need not be a problem in maintenance of stands. Where a maximum of winter-hardiness is required, such varieties as Grimm, Canadian Variegated, and Ranger are available. For those sections of the area not requiring the maximum degree of winter-hardiness, such varieties as Atlantic, Buffalo, Kansas Common, and Northern Common are recommended. Common alfalfa strains originating in Texas, Arizona, New Mexico, or in Argentina are to be avoided because they lack sufficient winter-hardiness for the Northeast.

Heaving caused by alternate freezing and thawing, particularly on wet soils, is a common cause of winterkilling of alfalfa. Heaving losses may be minimized by making sure that good surface and underdrainage prevail, by growing a grass in association with alfalfa, by permitting plants to go into the winter with high root reserves, and by having the protection of 6 to 8 inches of top-growth vegetation.

Disease weakened plants also winterkill easily. Bacterial wilt, a disease which plugs the vessels within the plant, roots, and crown, is one of the most severe diseases of alfalfa. It is apt to be most severe where alfalfa has been grown for several years. Plants weakened by this disease not only winterkill easily but they also may succumb any time during the growing season. Root rot or crown rot caused by the fungus *Sclerotinia* is another serious disease in the warmer areas of the Northeast that takes its toll during the winter and early spring months. This disease is especially harmful during mild or open winters. Alfalfa plants weakened by insect injury are also subject to winterkilling.

Alfalfa "Yellows"

During the growing season, yellowing of alfalfa is frequently noted. Alfalfa "yellows" may be caused by any one or combination of the following: (1) Drought, (2) boron deficiency, (3) potash deficiency, (4) magnesium deficiency, (5) Pseudopeziza and other leafspots, (6) downy mildew, (7) bacterial wilt, and (8) leafhopper injury. Each of these are characterized by different leaf symptoms and usually can be differentiated by the careful observer. It becomes apparent that the three types of yellows caused by deficiencies of nutrients can be remedied through

proper fertilization. For those caused by pathogenic organisms, reliance must be placed upon resistant varieties since control is either unfeasible or uneconomical by the use of fungicides. That caused by leafhoppers can be eliminated by the use of insecticides. Nutritionally, the forage from yellowed alfalfa is lower in carotene than that of healthy green plants. Likewise, leaves affected by yellows generally drop and thus one of the most nutritious parts of the plant is lost.

Insects

An insect that has been building up in numbers during the past few years is the spittle bug. This insect is becoming a serious threat to alfalfa production in the Northeast. Leafhoppers also continue to be a problem, more serious in some years than others. Both insects can be controlled by insecticides but then there is the danger of poisonous residues being carried over to the hay. Some of the new organics offer considerable promise. J. O. Pepper, Pennsylvania State Extension Entomologist, has found chlordane and toxaphene effective in the control of spittle bug. These chemicals can be applied at the rate of 2 pounds of 50% wettable powder in 100 gallons of water per acre as a spray or as a 5% dust applied at 30 pounds per acre.

Application time for the control of this insect is critical since the application must be made just after the overwintering spittle bug eggs have hatched, which is when the plants are 3″ to 4″ tall in the spring. If the material is applied before the plants have reached a 5″ or 6″ height, residue does not carry over into the hay. Leafhoppers can be controlled effectively by the use of a dust containing 66% fine dusting sulfur, 10% pyrethrum powder, and 24% inert powder applied at the rate of 25 pounds per acre.

Disease and insect resistance bred into new alfalfa varieties offers the most feasible method of controlling many of the common pests of alfalfa. Plant breeders already have developed some promising new varieties with disease resistance. It is hoped that varieties with resistance to both the diseases and insects common to the Northeast can be developed now that plant breeders are at work on these problems in this region. Atlantic alfalfa from the New Jersey Station and Narragansett from the Rhode Island Station already have been developed specifically for Northeast conditions.

The New Varieties

The use of new alfalfa varieties offers some help in meeting production problems in the Northeast, particularly disease problems. These varieties and some of their characteristics are:

Ranger, originated by the Nebraska Agricultural Experiment Station and the U. S. Department of Agriculture, is highly resistant to bacterial wilt disease and is also relatively cold-resistant. It is therefore recommended for those areas in the Northeast where a high degree of cold tolerance and resistance to bacterial wilt are desired. There is a good supply of seed of this variety available.

Buffalo is also highly resistant to bacterial wilt. It was developed by the U. S. Department of Agriculture and the Kansas Agricultural Experiment Station from Kansas Common and is suited to those areas of the Northeast where a maximum of winter-hardiness is not required but resistance to bacterial wilt is needed. Seed of this variety is available commercially.

Atlantic, a high-yielding variegated variety from the New Jersey Agricultural Experiment Station, is one of the best adapted in the Eastern States. It is somewhat tolerant but not resistant to bacterial wilt and therefore should not be used where long-time stands are desired or where bacterial wilt is a serious problem. There is only a limited amount of seed available at present.

Williamsburg is a Virginia selection from Kansas Common. It maintains its stand under eastern Virginia condi-

tions on account of high resistance to stem rot. It is being tested in many states, but there is no seed on the market at present.

Narragansett, a variegated strain developed by the Rhode Island Agricultural Experiment Station, is proving highly productive in the Northeast. This variety is relatively free of foliar diseases. As regards winter-hardiness, it falls in the same group as Ranger, Grimm, and Canadian Variegated. Narragansett, like Atlantic, is not resistant to bacterial wilt, hence should not be seeded in fields where this disease is a problem. Seed of this variety is now being increased commercially.

Despite the production problems encountered in growing alfalfa, it is a plant hard to beat for forage in the Northeast. Research workers are making progress in solving these problems and plant breeders are developing better varieties for this area. These developments promise a better future for alfalfa culture in the Northeast.

Know Your Soil

(*From page* 17)

This soil was limed to an optimum pH value of approximately 6.8 and the fertilizer ingredients varied. In Figure 4, Number 1 shows the results of carrots produced where nitrogen was the only limiting factor, Number 2 phosphorus was the only limiting factor, and Number 3 potassium. Number 4 shows the results where a complete fertilizer was applied. There is no doubt that after the pH value was corrected, potash became the most limiting factor for carrots.

For five years a ton of 5-10-10 fertilizer was applied annually to this soil in comparison with the normal fertilization program of the grower, which consisted of 300 to 400 pounds of fertilizer per acre annually. At the end of the five-year period, bulk samples were obtained from the field with a post-hole digger, thoroughly mixed, and brought to the greenhouse for further study.

In Figure 5, Pot 41 represents the grower's treatment and 49 represents the five-year fertilizer program, both without additional treatment. Pot 51 represents the grower's soil and 60 the fertilizer program, both with the same supplemental applications of fertilizer. It is believed that this clearly illustrates the importance of proper soil treatment in efficient and maximum crop production.

Practically all plants have different nutritional requirements. All soils differ in the physical and nutritional status. Millions of acres of Penn silt loam or related soils that are unproductive can be brought into efficient and maximum production by correcting the limiting factors.

Too Much Velvet?

(*From page* 5)

innovation of ready-to-eat alfalfa. Good old bacon and eggs and the pancake standby came as a second course.

Here you could interrupt my meditations and inquire if we ever heard of electric lighting and motor vehicles in our town and if maybe these didn't shake us out of a lethargy into a lather. That's quite easy to answer, my friend.

In distant parts there were whole

cities beginning to read and work by electric lamps, and in fact, to brag a little as well. A city in the central part of our state was really the first sizable community to put in and operate a municipal lighting plant. (Name on request accompanied with a bouquet and a stamped envelope.)—But except for a few dingy 20-watt carbon filament bulbs at the Methodist church, my memory doesn't swing back to the electric light as the first break we had with tradition and inertia. By the time we got them we were far gone on the "glory road to ruin."

And don't mention the auto car with the lever steering rod and the brass headlamps and linen dusters. For almost ten years after folks began talking about improved roads to promote motor travel, the only owner of one of those gas buggies was the retired banker. And he was so far removed from the hoi-polloi of average citizens that anything he had remained a luxury to be deplored for a long while.

I CAN remember clearly, of course, my first auto ride and the first horseless carriage to enter our bailiwick. The banker's son, a high school classmate, took me and my dinner bucket home from school one day; and Hi Henry's Minstrels used the first motor vehicle ever to traverse the streets of our home town, a shiny black carriage with bicycle wheels. I waited for three hours to see it, but it was just about as close to our humble lives then as atomic energy is to tractor fuel these days. Correspondents who recall that minstrel outfit are welcome to resign all pretentions to youth and write me about it.

But anyhow, barring the motor car and the electric light, the few simple innovations spoken about previously served to get us in a proper spirit to eschew and abjure and abandon all the sundry hard hand tasks and health-promoting inconveniences which served in reality as steady blood transfusions to a sturdy and self-reliant economy.

In due time it brought on a leisure class that didn't have the stamina, the ambition, the imagination, or the energy to utilize that new leisure well. Not for a moment would we return to the era that the new arrangements ushered out. We of the city are locked in the shackles of modernity, and the erstwhile independent farmer is also hog-tied and riveted to the mechanical-electrical age just as we all are. If it is a form of slavery, it's also the boon of freedom.

IN times of relative peace and tranquillity these new physical capacities we have become wedded to usually combine to push us into extreme levels of production, so that factories need super salesmen to hustle goods out on the partial payment plans; while farmers rely on the government to make a food surplus endurable—at least to them.

Here, of course, under normal circumstances we can extend our outlets and our services across the seas to not-so-distant lands of meager resources, helping them to absorb the surplus of our high-gear production line. That some of the cost of teaching them how to get something for nothing and to learn new ways and wants must come from our own pockets—that's natural for a few years in bringing these underprivileged consumers a taste of modernity. Of course, we are happy about it because they are entitled to it. Our main drawback seems to be that we rush them electronics and power plows before they are wise to hygiene or nutrition or what to do with a monkey wrench.

Those pioneer innovations of ours surely marked the vivid way to velvet living, all right, not only for us but for denizens of countless countries who are further behind than we were in the hoot-and-holler days.

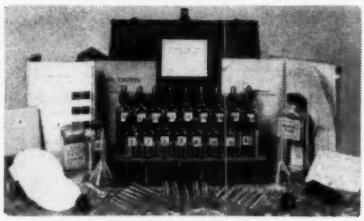
The significant thing about all this change lies in the outstanding fact that no government dictum forced it on us. Here is one form of slavery

NO_3 P K pH Fe Mg Na Al

More . . . Much more . . . by the Spurway Method

Simplex

SOIL TESTING



Soil Testing Is Imperative to
OBTAIN MAXIMUM CROP YIELDS AT A MINIMUM COST

The Complete
Simplex Soil Test Outfit—Is practical for use in any locality—requires no waiting—allows for frequent testing. Contains all the solutions and apparatus necessary for 100 to 300 soil tests for each of 15 important soil chemicals including trace elements and tissue tests for Nitrates, Phosphorus and Potassium.
Complete $36.00.
Solution replacements only $18.00.

The Junior
Simplex Soil Test Outfit—Contains all the materials and solutions necessary to make 100 to 300 tests for each of 6 soil chemicals plus tissue tests for N-P-K.
Complete $25.00.

The Farm
Simplex Soil Test Outfit—Designed for the smaller grower, it contains 100 tests for 5 soil elements plus tissue tests for N-P-K.
Complete $16.00.

The Home
Simplex Soil Tester—Is the certain way to garden. Makes 20 tests for each of 4 important soil elements. Nitrogen, Phosphorus, Potassium, and Acidity (Soiltex), plus tissue tests for N-P-K.
Complete $6.50.

Full Directions and Color Charts Accompany Each Set—All Prices F.O.B. Cleveland—Prices Subject to Change—Write for detailed information and catalog.

The Edwards Laboratory
P. O. Box 2742-T Cleveland 11, Ohio

Ca NH_4 NO_2 CO_3 SO_4 Cl Mn

and enforced dependence on each other which no debatable social reform laws foisted on our heads. No congressman in our district ever made the welkin jangle with proposals for new inventions. I admit after they were here and well into general use, the electioneering zealots whooped it up for stiffer terms and harsher regulations. That was the penalty we paid for getting tossed into a cycle of community relations to replace the haughty spirit of lonesome achievement.

When we ceased gradually to make the things we needed and used at home or in the village, and relied more and more upon the skill and steady effort of trained "specialists" to make our stoves run and our toilets flush and our telephones ring—that's when we shifted into high gear for the rock-strewn glory road. Even velvet can get badly mussed up and need patching, just like a pair of pioneer overalls.

Therefore, whenever we as a people trained to luxury run into some snags that trip up some of our suppliers and purveyors, it just means chaos and confusion. Even the good old government, which didn't start this curious cycle to glory, has a tough time as a referee. All this surge and struggle for bigger and better things to use and enjoy hinges so much on prices and wages that anybody who tries to solve it by putting his foot forward firmly usually mashes some very tender bunions.

OF course, there are still areas of this standardized land where the swift advance of science has not broken old spells of ancient mores. But thanks to the fast pace of our providers and inventors, such communities are becoming more rare. This is as it should be, if we as a nation are to conquer the vast crude world of primitive life with democracy and progress.

I applaud Point Four all right, being in favor of technical instruction to belated populations. But we ought to have a Point Five—on how to make it work abroad as well as at home.

You simply have to take the truth out there, but we must be sure that the truth will make us free.

Providing good and sensible teachers to extend the world's knowledge to hinterlands of hindered folks is always the first move to make. But let's be sure the pupils are ready to accept and make good use of the new-found science and improved methods. With us it took fourscore years of bewildered groping and testing to spread the velvet so snugly around us. Two generations of us now living have known nothing else but. We can hardly expect the dormant nations to suck at the Pierian Spring and come back blooming with the eternal spirit of youth and eager to wear the velvet like we do.

So let's cut and fit that velvet on foreign shoulders with great care and nicety. Our economy needs adoption by them of the good (and costly) things of life—maybe theirs does too, or will in a dozen years or more. The thing we've got to watch is not to fit that velvet on too fast in tailoring overseas programs—or it might drag in the muck or rip apart in the seams. We've got lots to spare here, but why waste the velvet when gingham or calico might do for awhile?

WELL, it's passing strange how we old-timers taught ourselves to do new tricks and accept new gadgets. Now we are trying to teach other folks the same benefits. Unfortunately, a majority of them are about where we were several centuries ago. The usages and articles we thought were in line for replacement forty years ago are just about what many of the submerged folks would think mighty fine and comfortable.

I'm not recommending foreign relief based on the oilstove, the telephone, and the water closet. Just plain old bacon and eggs, a roaring fire with ample fuel for the cook, a good, healthy pair of lungs, and a digestion that waits on appetite rather than equipment are the best signs of the dawn of tomorrow.

This Agricultural Family Yields Big Savings

Seedling blights, fungous diseases and mites can rob farmers of countless bushels of potential yield, this year when we can least afford it.

The quality products shown in the Naugatuck Agricultural family stand ready to serve 1951's all-out production effort by saving your crops from such ravages as these.

**Reg. U. S. Pat. Off.*

UNITED STATES RUBBER COMPANY
NAUGATUCK CHEMICAL DIVISION
NAUGATUCK, CONNECTICUT

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)

Reprints

F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What is the Matter with Your Soil?
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—the Aristocrat
GG-6-45 Know Your Soil
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
H-2-46 Plow-Sole Placed Plant Food for Better Crop Production
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
AA-5-46 Efficient Fertilizers Needed for Profit in Cotton
WW-11-46 Soil Requirements for Red Clover
A-1-47 Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop
I-2-47 Fertilizers and Human Health
P-3-47 Year-round Grazing
T-4-47 Fertilizer Practices for Profitable Tobacco
AA-5-47 The Potassium Content of Farm Crops
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
GG-10-48 Starved Plants Show Their Hunger
OO-11-48 The Use of Soil Sampling Tubes
TT-12-48 Season-long Pasture for New England
E-1-49 Establishing Bermuda-grass
F-2-49 Fertilizing Tomatoes for Earliness and Quality
J-2-49 Increasing Tung Profits with Potassium
CC-8-49 Efficient Vegetable Production Calls for Soil Improvement
EE-8-49 Why Use Potash on Pastures
GG-10-49 What Makes Big Yields
KK-10-49 An Approved Soybean Program for North Carolina
QQ-11-49 Some Fundamentals of Soil Building
RR-11-49 Alfalfa as a Money Crop in the South
SS-12-49 Fertilizing Vegetable Crops
A-1-50 Wheat Improvement in Southwestern Indiana
B-1-50 More Corn From Fewer Acres
F-1-50 A Simplified Field Test for Determining Potassium in Plant Tissue
I-2-50 Boron for Alfalfa
J-2-50 Use Crop Rotations to Improve Crop Yields and Income
K-3-50 Metering Dry Fertilizers and Soil Amendments into Irrigation Systems
L-3-50 Food For Thought About Food
N-3-50 Can We Afford Enough Fertilizer to Insure Maximum Yields?
O-4-50 Birdsfoot Trefoil—A Promising Forage Crop
P-4-50 Potash Production a Progress Report
S-4-50 Year-round Green
T-5-50 Physical Soil Factors Governing Crop Growth
U-5-50 Reseeding Crimson Clover Adds New Income for the South
V-5-50 Potassium Cures Cherry Curl Leaf
X-5-50 Fertilizers Help Make Humus
Z-6-50 Potash Tissue Test for Peach Leaves
AA-8-50 Alfalfa—Its Mineral Requirements and Chemical Composition
BB-8-50 Trends in Soil Management of Peach Orchards
CC-8-50 Bermuda Grass Can Be Used in Corn Rotations
EE-10-50 Band the Fertilizer for Best Results With Row Crops in Western Washington
GG-11-50 Tall Fescue in the Southeast
HH-11-50 The Miner Element Problem
II-11-50 Tree Symptoms and Leaf Analysis Determine Potash Needs
JJ-11-50 Insect Control Goes With Cotton Fertilizer Plan
KK-12-50 Surveying the Results of a Green Pastures Program
LL-12-50 Higher Fertilizer Applications Recommended in Wisconsin
MM-12-50 Erosion Removes Plant Nutrients and Lowers Crop Yields
NN-12-50 Plenty of Moisture, Not Enough Soil Fertility
OO-12-50 Know Your Soil. VI. Elkton Sandy Loam
A-1-51 Soil-testing Reduces Guesswork
B-1-51 Alfalfa, Queen of Forage Crops
C-1-51 Know Your Soil. VII. Magnesium-potassium Relation for Sweet Potatoes on Sandy Soils
D-1-51 The Vermont Farmer Conserves His Soil

THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)
The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)
The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)
The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)
Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)
Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)
Potash Production in America (Silent, running time 40 min. on 400-ft. reels.)
In the Clover (Sound, running time 25 min. on 800-ft. reel.)

OTHER 16 MM. COLOR FILMS AVAILABLE ONLY FOR TERRITORIES INDICATED

South: Potash in Southern Agriculture (Sound, running time 20 min. on 800-ft. reel.)
Midwest: New Soils From Old (Silent, 800-ft. edition running time 25 min.; 1200-ft. edition running time 45 min. on 400-ft. reels.)
West: Machine Placement of Fertilizers (Silent, running time 20 min. on 400-ft. reel.)
Ladino Clover Pastures (Silent, running time 25 min. on 400-ft. reels.)
Potash From Soil to Plant (Silent, running time 20 min. on 400-ft. reel.)
Potash Deficiency in Grapes and Prunes (Silent, running time 20 min. on 400-ft. reel.)
Bringing Citrus Quality to Market (Silent, running time 25 min. on 800-ft. reel.)
Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.
Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.
Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.
Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.
West: Department of Visual Education, University of California, Berkeley 4, California.
Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.
Department of Visual Instruction, Oregon State College, Corvallis, Oregon.
Bureau of Visual Teaching, State College of Washington, Pullman, Washington.
Canada: National Film Board, Ottawa, Ontario, Canada.

IMPORTANT

Request should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor

She was sweet but realistic. "When I crush you in my arms like this," he whispered, "what are you thinking of?"

Without hesitation she replied, "The manpower shortage."

* * *

A Scotchman was walking through a cow pasture one day when the wind blew his tam-o'-shanter to the ground. He tried on six of them before he found his own.

* * *

"Paw, long's yuh got yur carpenter's tools out, ah wisht y'd fix th' hinge on this kitchen door. Fly season's coming."

"Can't do it, Maw; too busy. Got to fix this garden gate so's the pigs can't git 'n th' garden. . . . Oh, hullo, Jim! Yuh fixin' to do a little fishin' with that there hook and line?"

"Yeah, thought mabbe y'd go along."

"Reckon I might. . . . Oh, Maw! Pick up muh tools, will yuh? I gotta go help Jim."

* * *

These days a farmer must be smart enough to understand all the advice the government gives him and select that which will do him the least harm.

* * *

"Children," said the teacher, "I want you to write an essay about King Alfred. But don't waste time writing about the burning of the cakes."

One essay read: "King Alfred went and knocked on the door of a lonely cottage in a forest and was admitted by a farmer's wife. What happened after that I'm not allowed to say."

Willie Johnson, a sawed-off, beaten-down little colored fellow, was arraigned in a Texas district court on a felony charge.

The clerk intoned: "The State of Texas versus Willie Johnson!"

Before he could read further, Willie almost broke up the meeting by solemnly declaring, "Lawdy! What a majority!"

* * *

The teacher was giving her students a lesson in geography, and was talking about Orientals and Occidentals.

"Orientals," she explained, "are those people who live in the Far East. The people who live in the West are called Occidentals. We are all Occidentals."

A bright boy of 11 piped up: "My mother says I'm an 'accidental'."

* * *

"Why does Geraldine let all the boys kiss her?"

"She once slapped a lad who was chewing tobacco."

* * *

A motorist and his wife traveling through the Blue Ridge Mountains stopped at a one-pump gas station before a mountaineer's cabin. After the man told the proprietor to fill the tank, his wife asked: "Is there a rest room here?"

"No, ma'am, there isn't," replied the gas man, "but you'll find a mighty comfortable rocker up there on the porch."

FERTILIZER BORATES

a "A NEW HIGH GRADE" *product*

1—FERTILIZER BORATE, HIGH GRADE—
a highly concentrated sodium borate ore concentrate containing equivalent of 121% Borax.

2—FERTILIZER BORATE—a sodium borate ore concentrate containing 93% Borax.

Both offering economical sources of BORON for either addition to mixed fertilizer or for direct applications where required

Each year larger and larger acreages of our cultivated lands show evidences of Boron deficiency which is reflected in reduced production and poorer quality of many field and fruit crops. Agricultural Stations and County Agents recognize such deficiencies and are continually making specific recommendations for Boron as a minor plant food element.

Literature and Quotations on Request

PACIFIC COAST BORAX CO.

Division of Borax Consolidated, Limited

100 Park Ave., New York 17, N. Y.
2295 Lumber St., Chicago 16, Ill.
510 W. 6th St., Los Angeles 14, Calif.

AGRICULTURAL OFFICES:

P.O. Box 290, Beaver Dam, Wisc. • First National Bank Bldg., Auburn, Ala.

You will want this book

DIAGNOSTIC TECHNIQUES

For

Soils and Crops

Their Value and Use in Estimating the Fertility Status of Soils and Nutritional Requirements of Crops

HISTORICAL INTRODUCTION

by

Firman E. Bear

Chemical Methods for Assessing Soil Fertility
by Michael Peech

Correlation of Soil Tests With Crop Response to Added Fertilizers and With Fertilizer Requirement
by Roger H. Bray

Operation of a State Soil-Testing Service Laboratory
by Ivan E. Miles and J. Fielding Reed

Operation of an Industrial Service Laboratory for Analyzing Soil and Plant Samples
by Jackson B. Hester

Plant-Tissue Tests as a Tool in Agronomic Research
by Bert A. Krantz, W. L. Nelson and Leland F. Burkhart

Plant Analysis—Methods and Interpretation of Results
by Albert Ulrich

Biological Methods of Determining Nutrients in Soils
by Silvere C. Vandecaveye

Visual Symptoms of Malnutrition in Plants
by James E. McMurtrey, Jr.

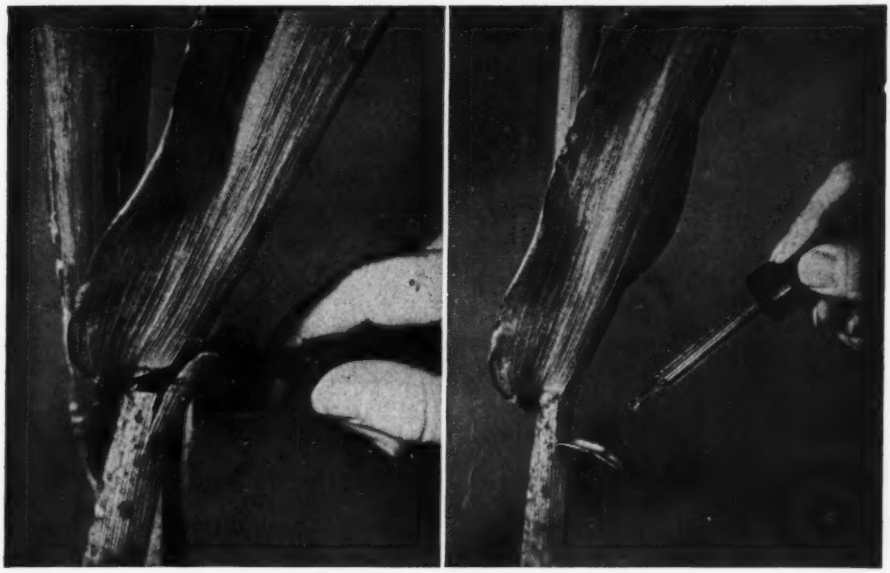
Edited by Herminie Broedel Kitchen, Associate Editor, Soil Science

Specially priced at $2.00 per copy

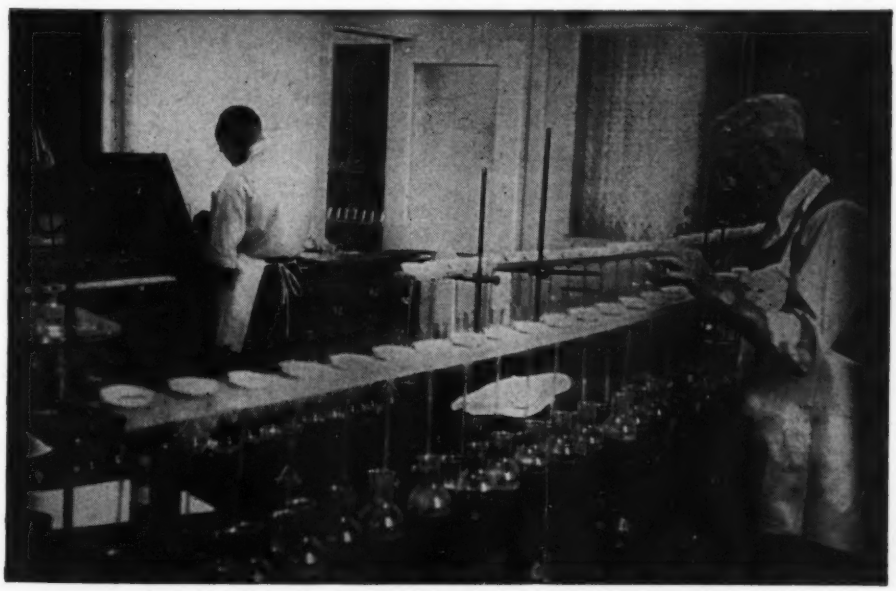
Copies can be obtained from:

AMERICAN POTASH INSTITUTE, Inc.

1155 Sixteenth St., N.W. Washington 6, D. C.

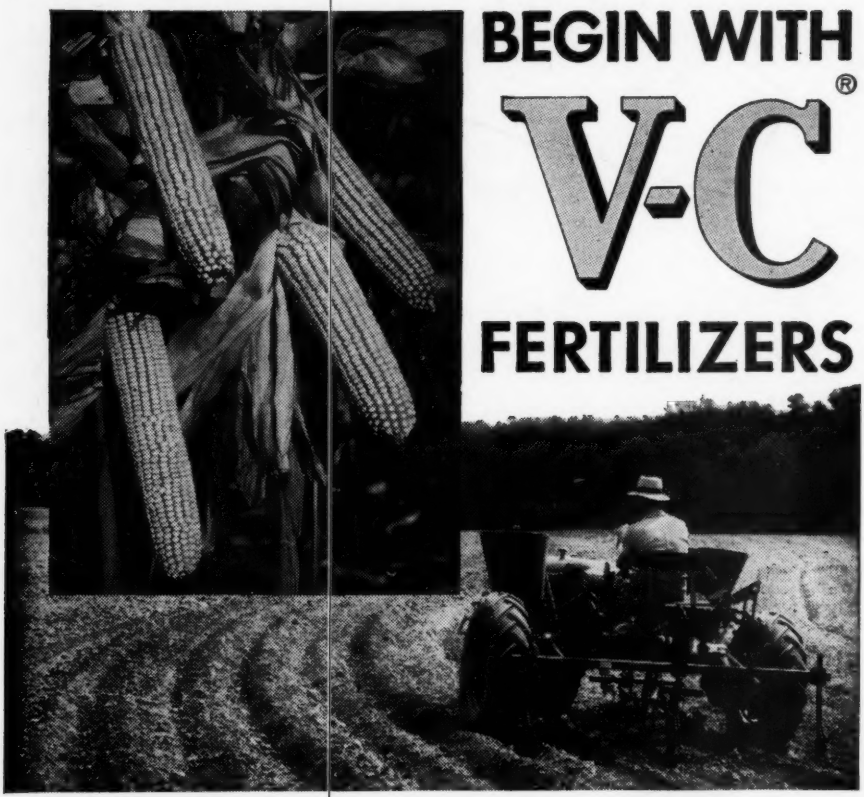


Nitrate tests can be made at the base of the leaf midrib without destroying the entire plant. This is an important consideration in making numerous tests on small experimental plots. The height of the plant at which nitrates are present as well as the intensity of the blue color gives an indication of the nitrate status of the plant.



Equipment used in a well-developed laboratory for soil analyses.

Better Yields



BEGIN WITH V-C® FERTILIZERS

V-C Fertilizers are produced in various analyses so that there is a V-C Fertilizer for every crop on every soil. Each V-C Fertilizer is a rich, mellow blend of better plant foods, properly-balanced to supply the needs of the crop for which it is recommended. For instance, V-C Corn Fertilizer contains the plant food elements that corn needs to make vigorous growth, develop strong sturdy stalks, healthy, deep-green foliage, and big ears loaded with better grain. Tell your V-C Agent you want the right V-C Fertilizer for each crop you grow. See what a big difference these better fertilizers make in your yields and your profits!

VC FERTILIZERS®

VIRGINIA-CAROLINA CHEMICAL CORPORATION

MAIN OFFICE: 401 East Main Street, Richmond 8, Virginia

Norfolk, Va. • Greensboro, N. C. • Wilmington, N. C. • Columbia, S. C.
Atlanta, Ga. • Savannah, Ga. • Montgomery, Ala. • Birmingham, Ala.
Jackson, Miss. • Memphis, Tenn. • Shreveport, La. • Orlando, Fla.
Baltimore, Md. • Carteret, N.J. • E. St. Louis, Ill. • Cincinnati, O. • Dubuque, Ia.